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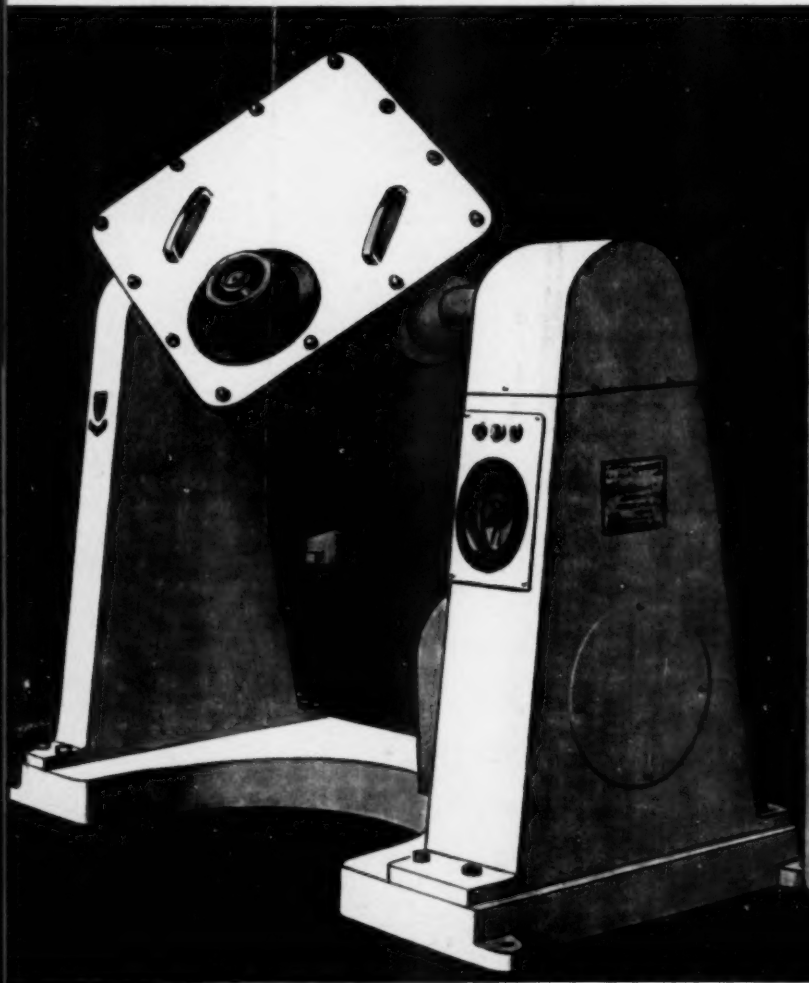

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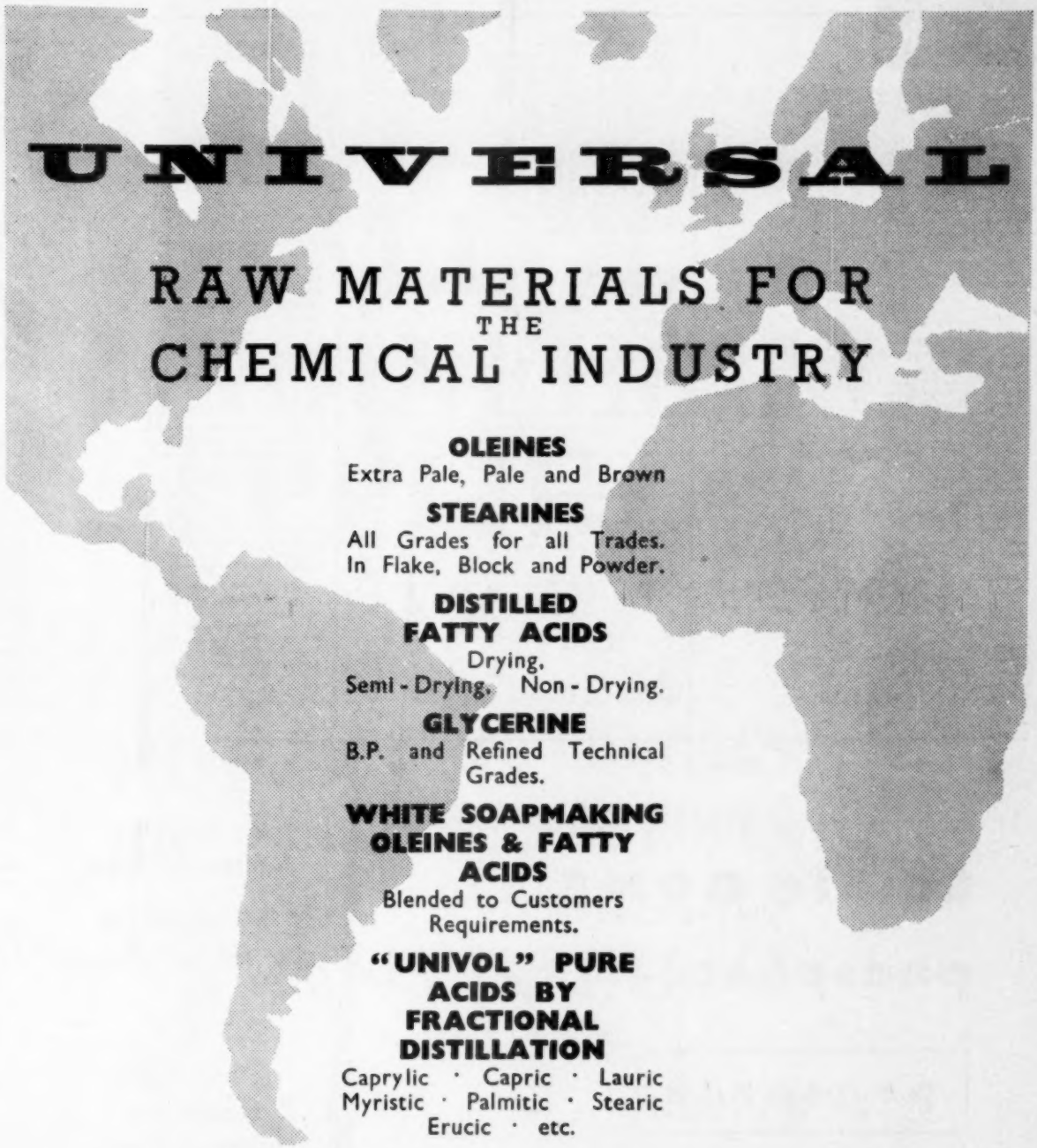

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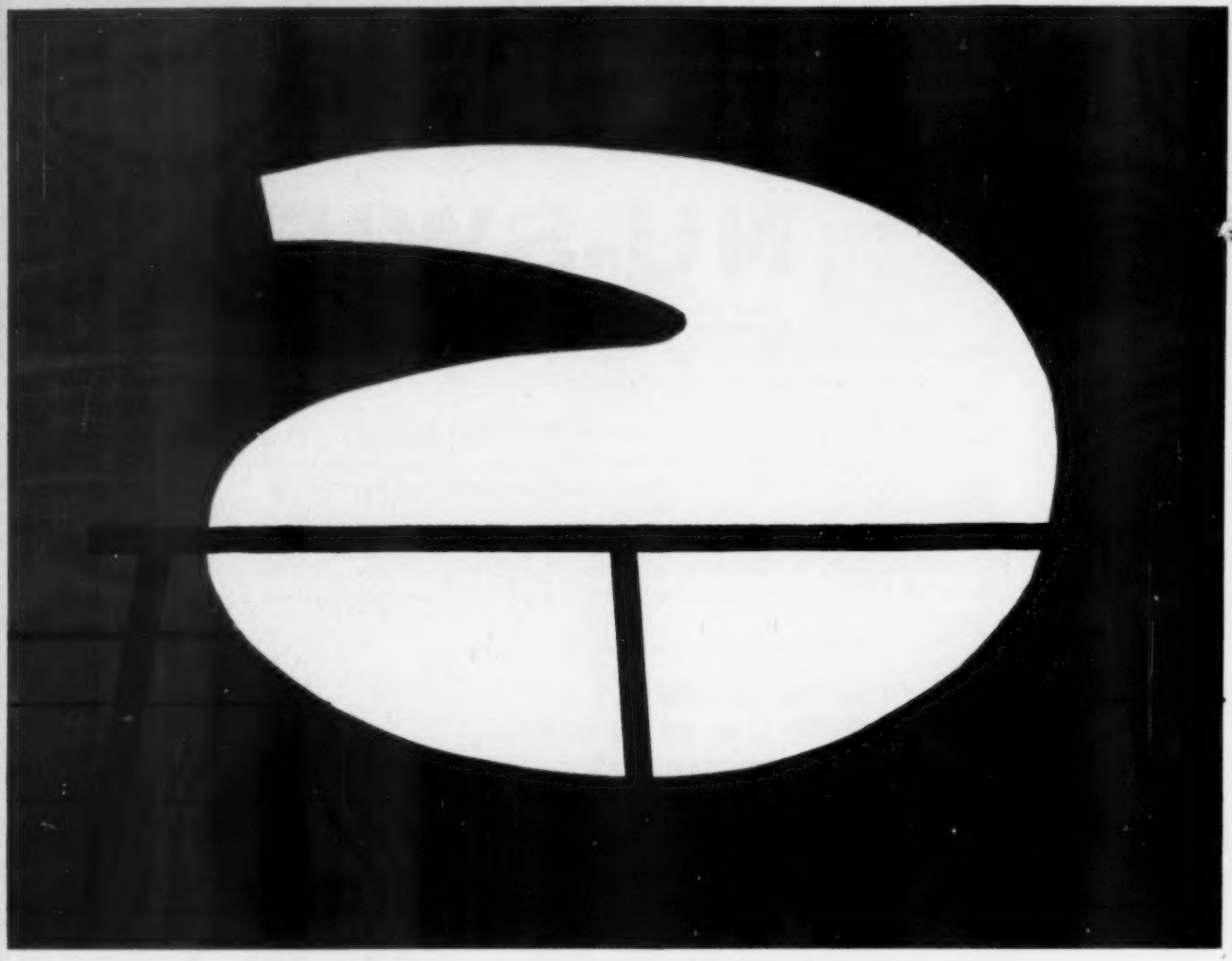

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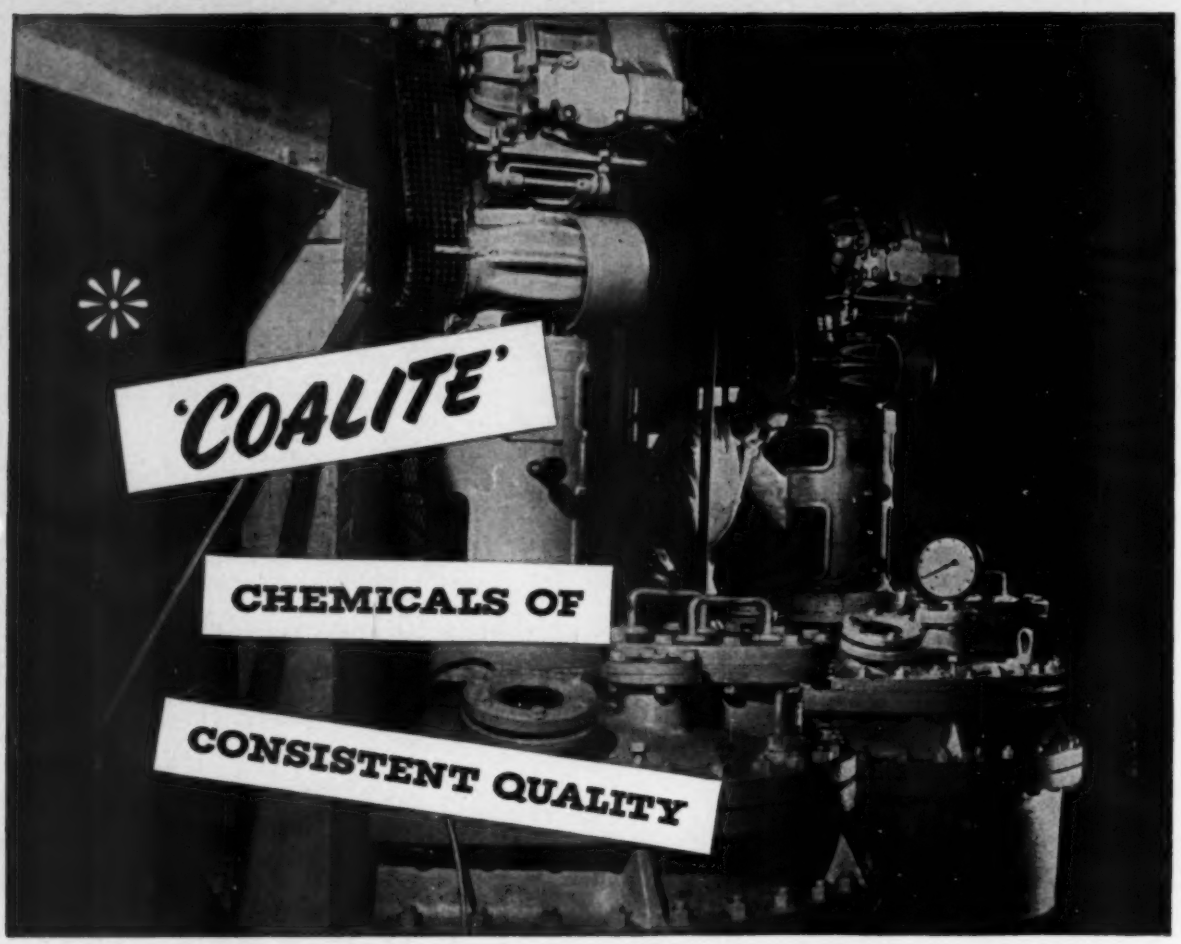

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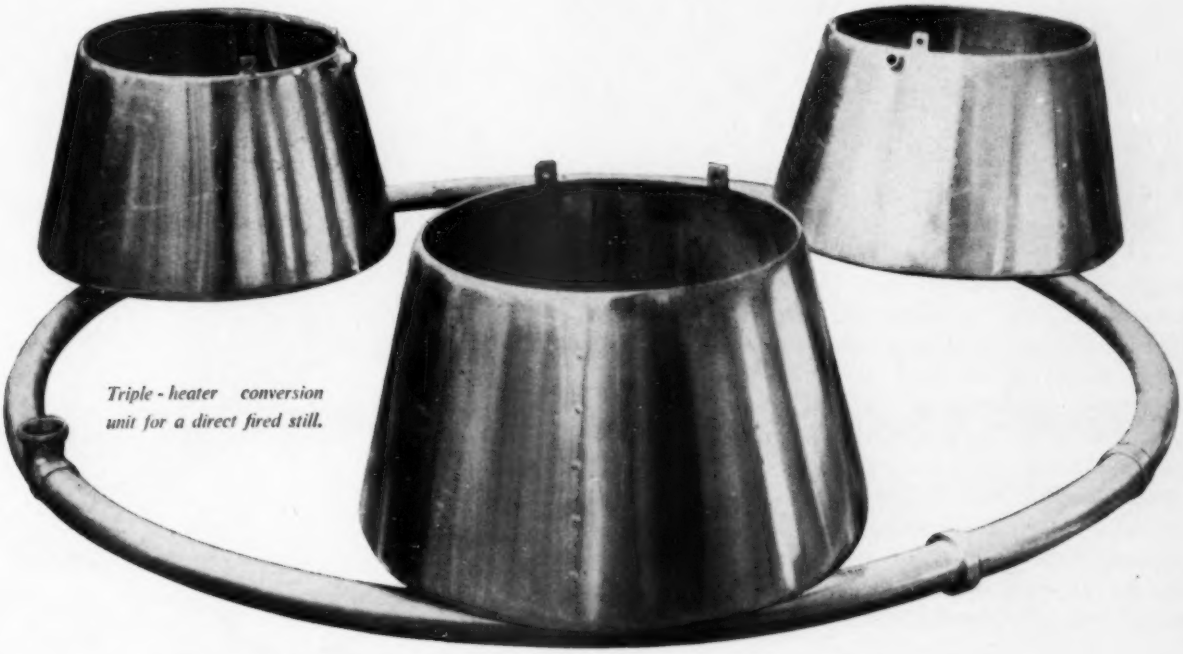

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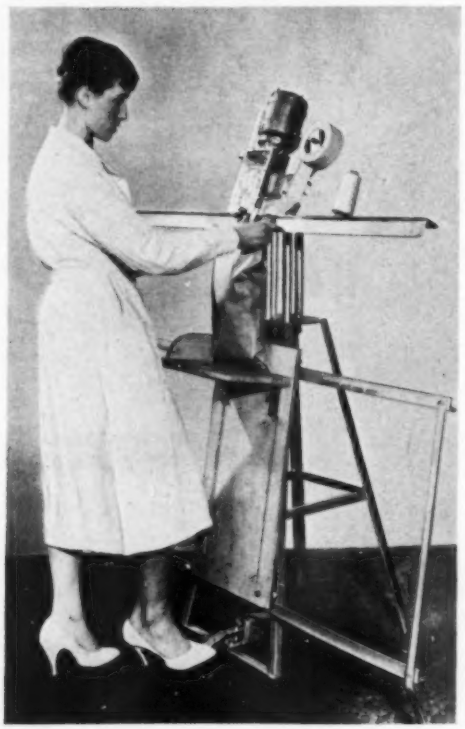

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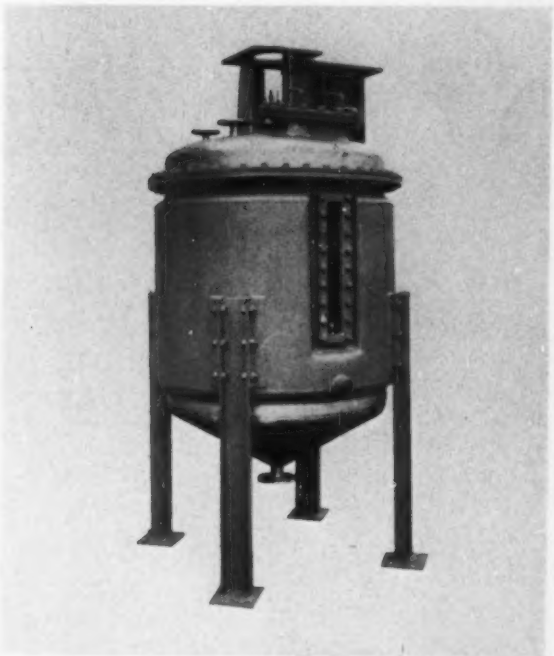

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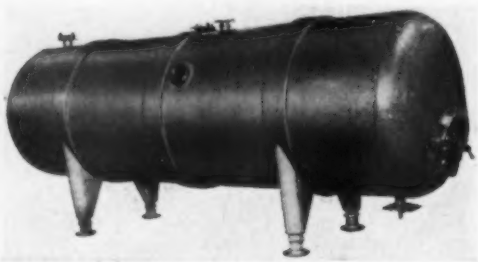

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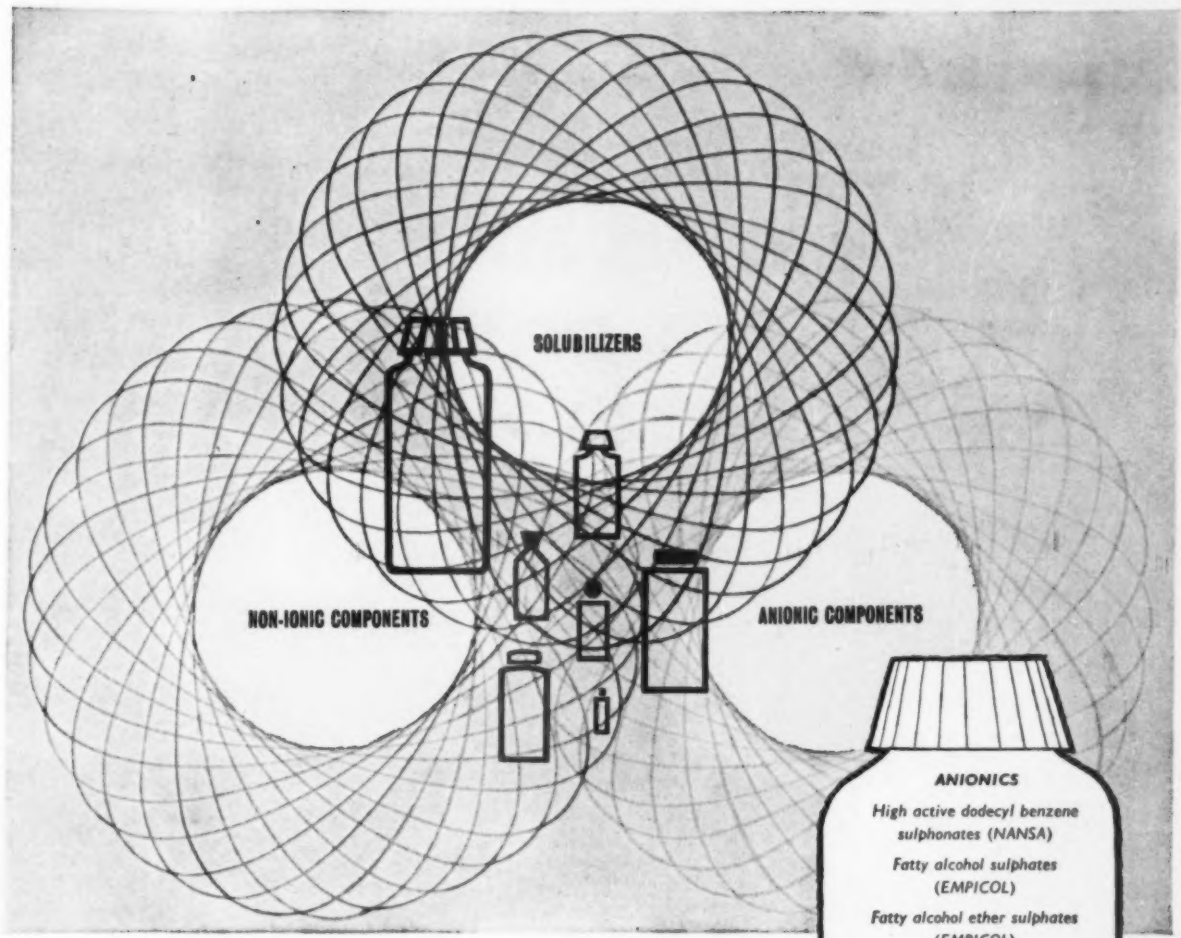

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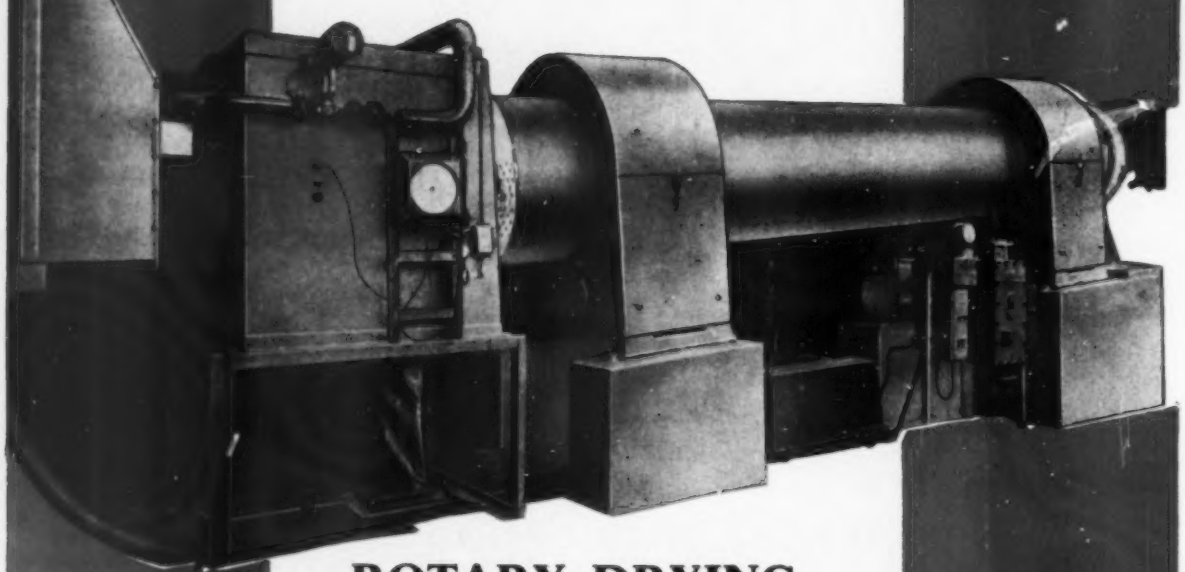

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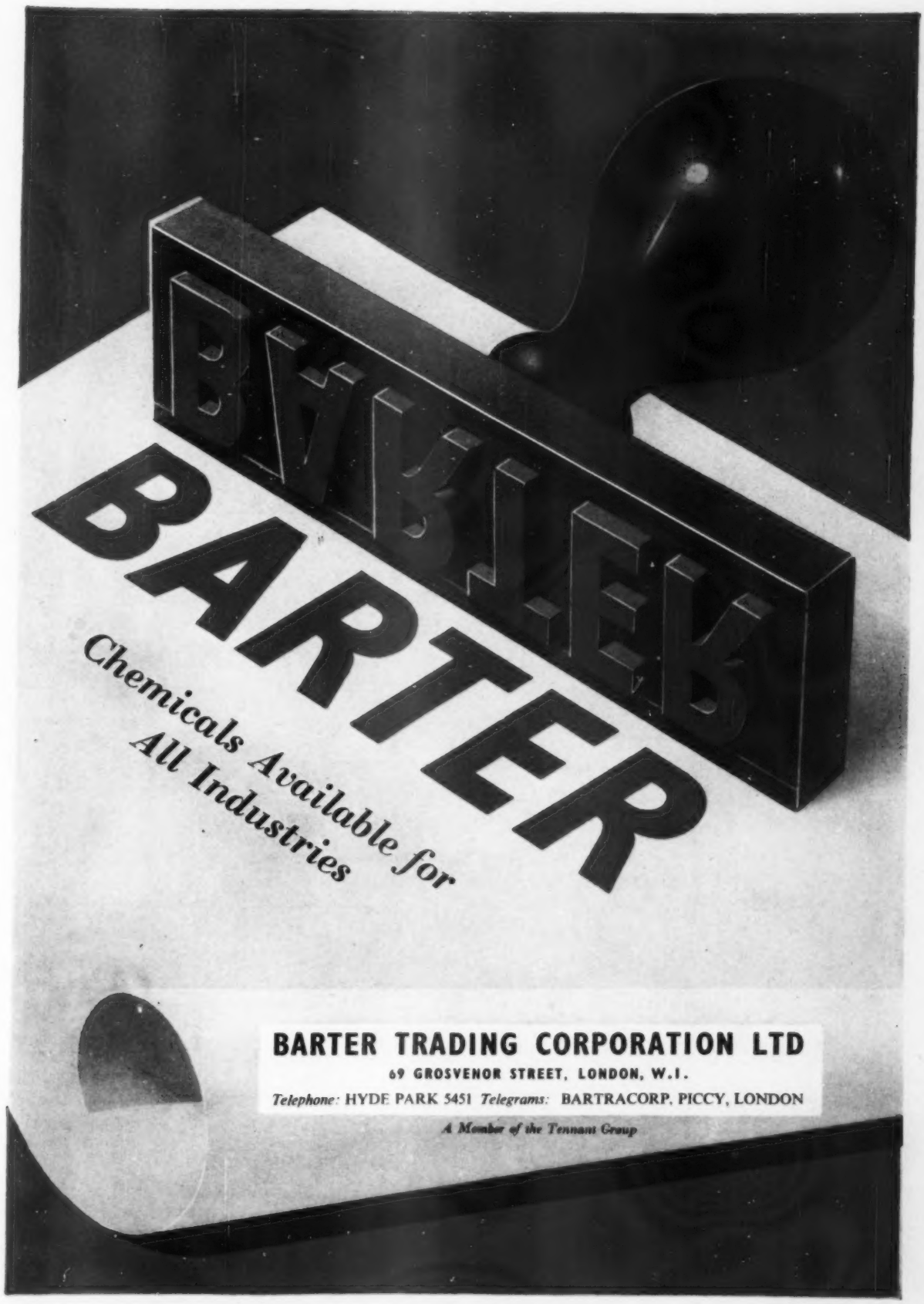
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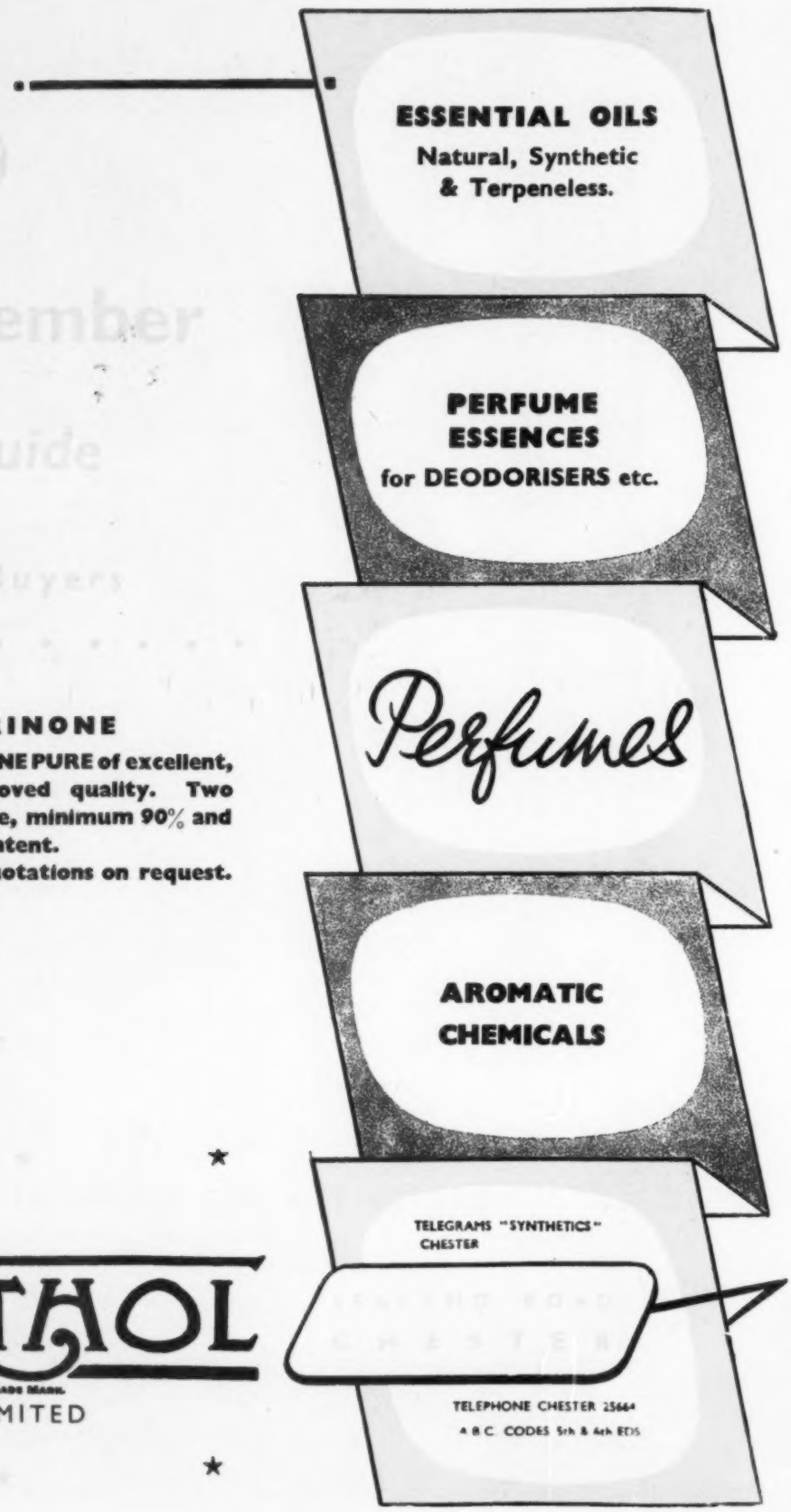

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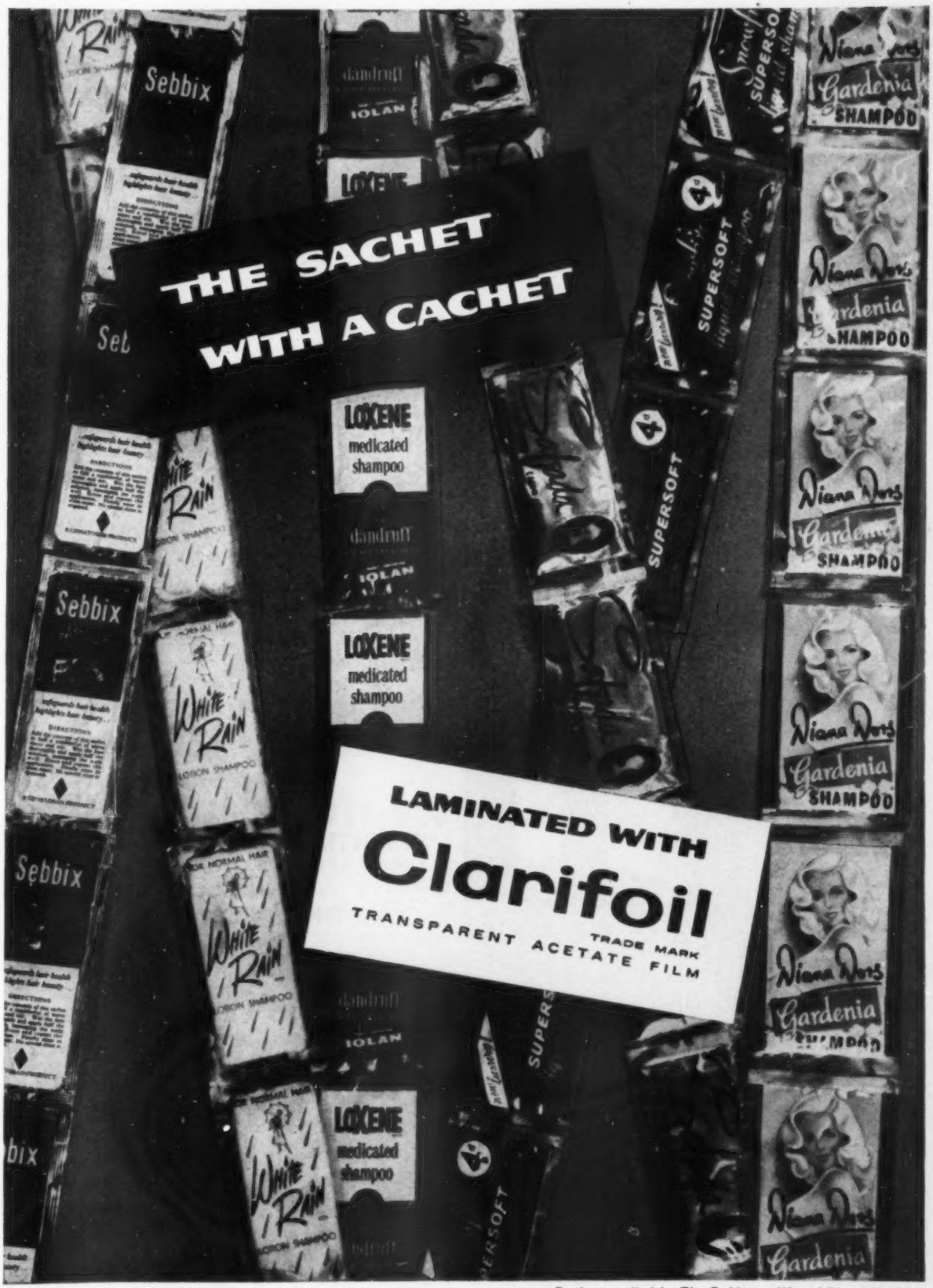

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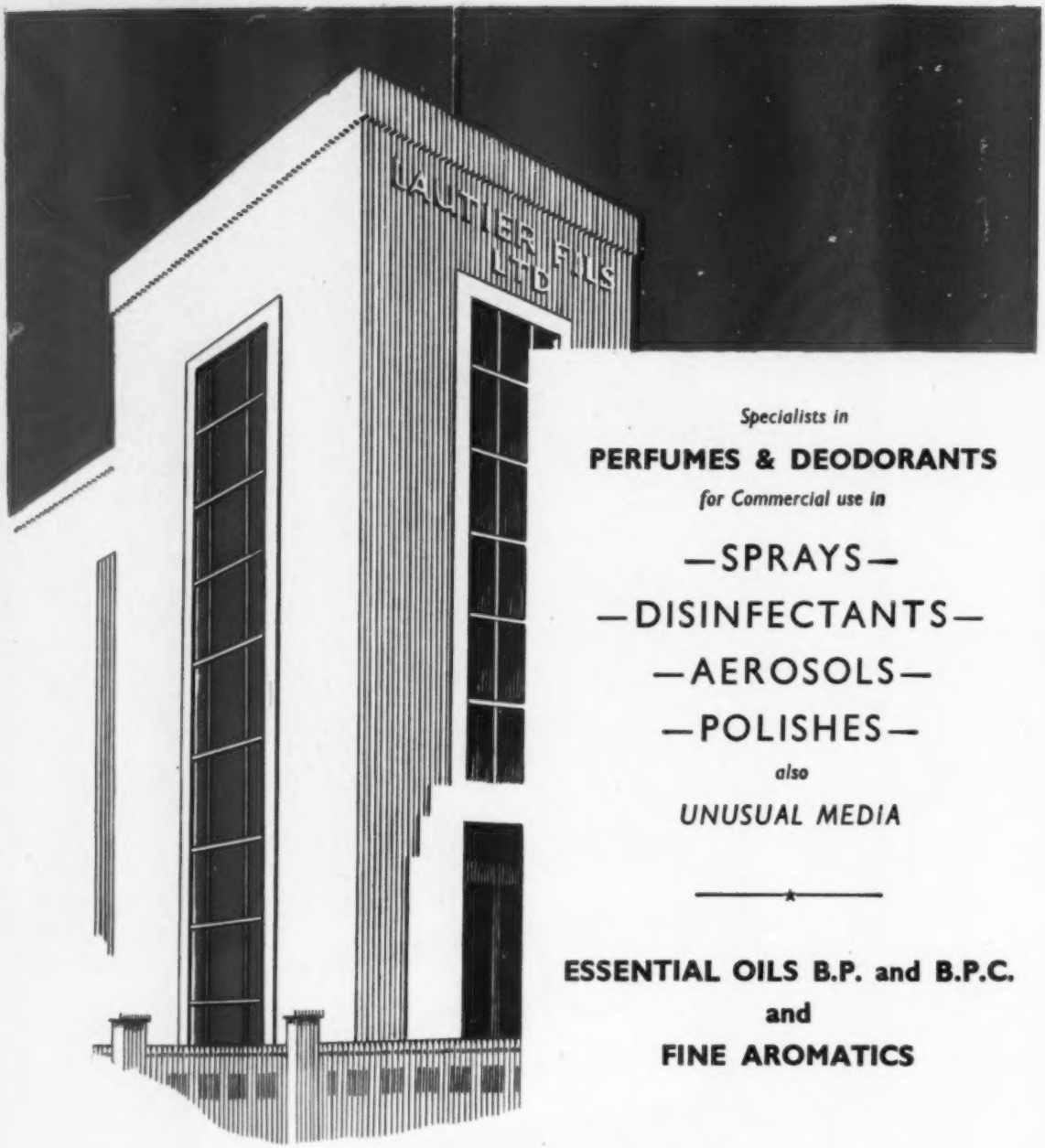

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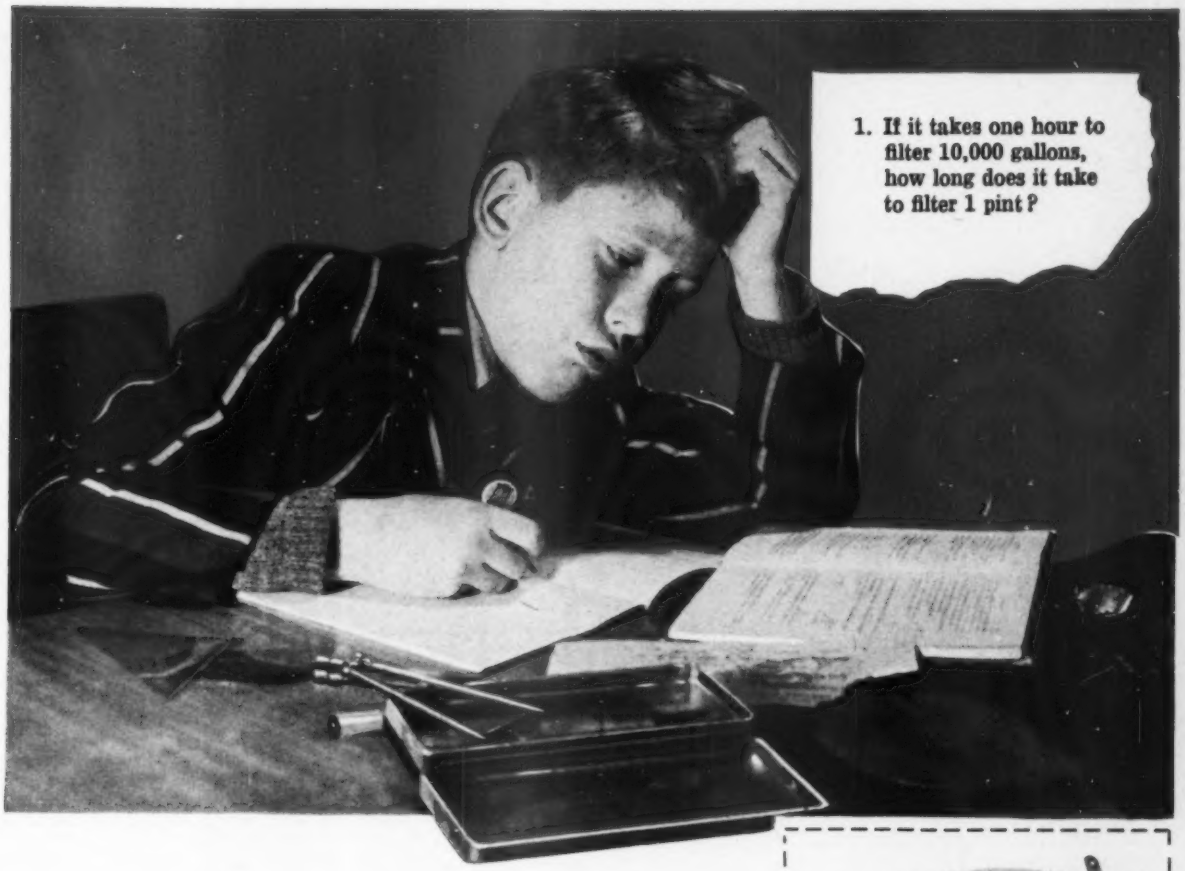

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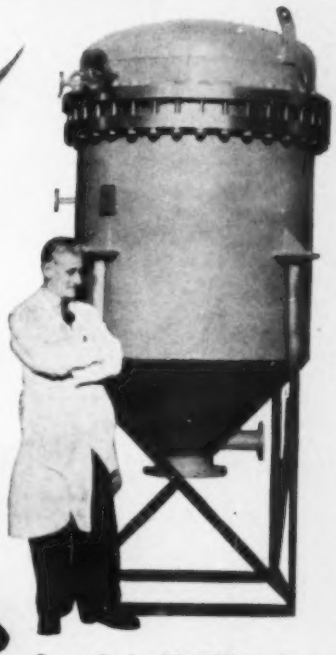

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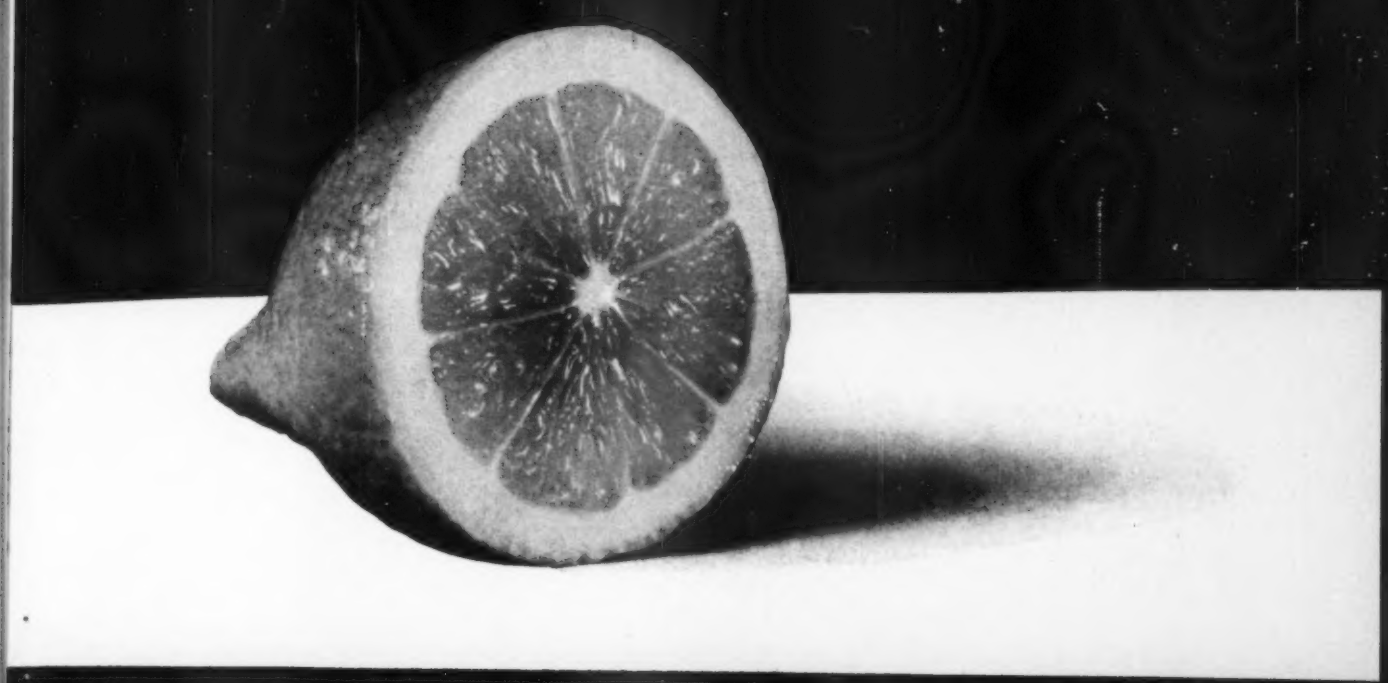

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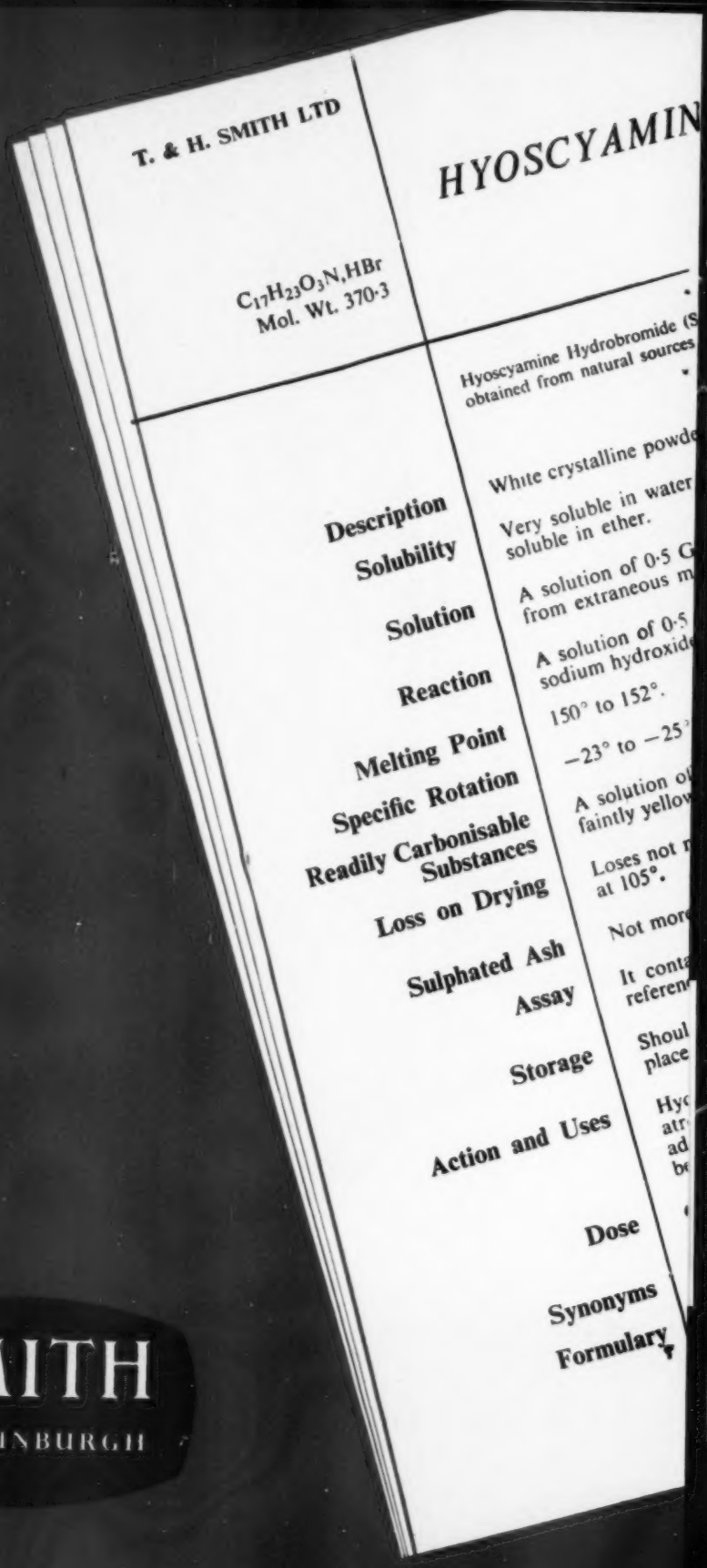

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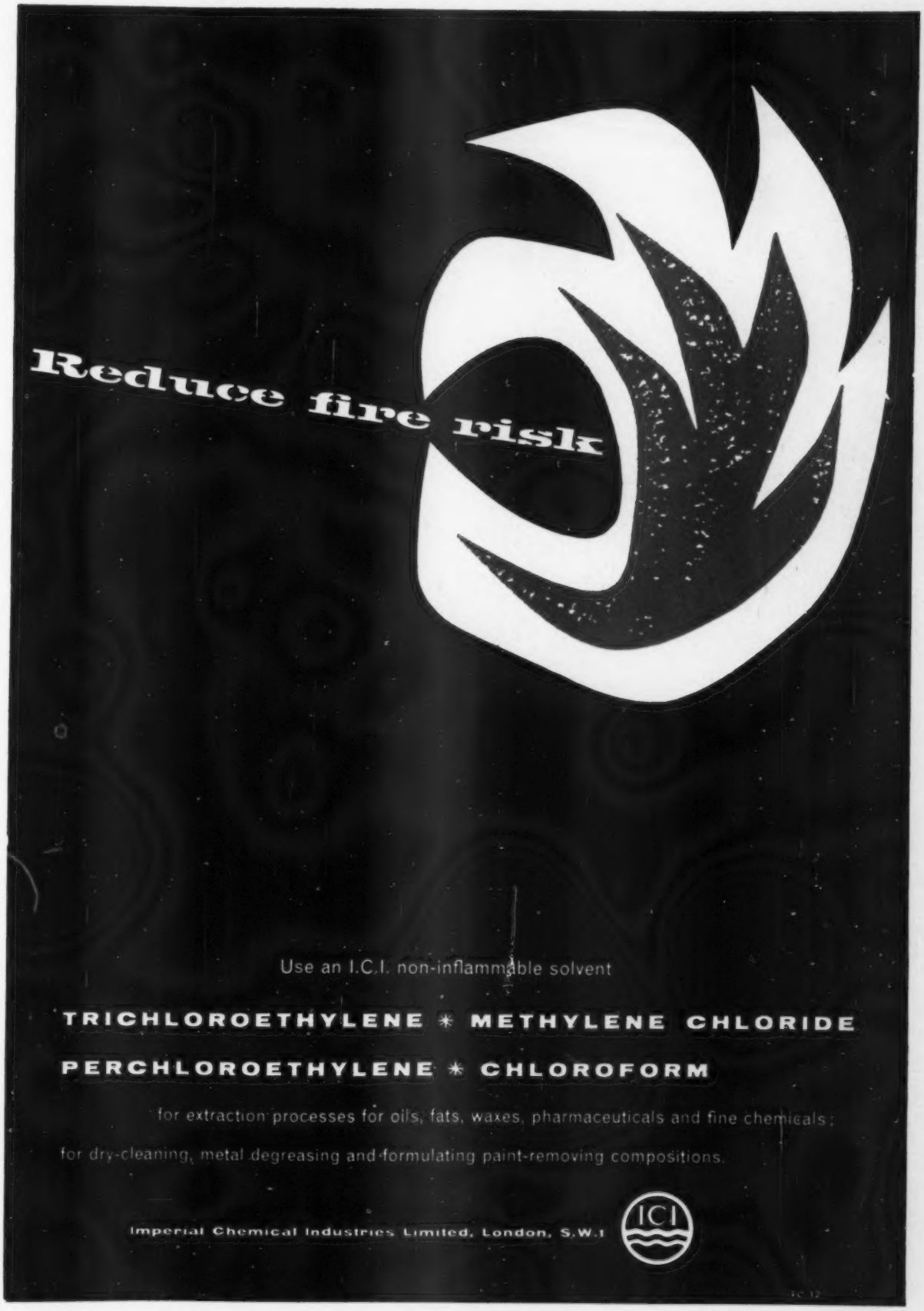
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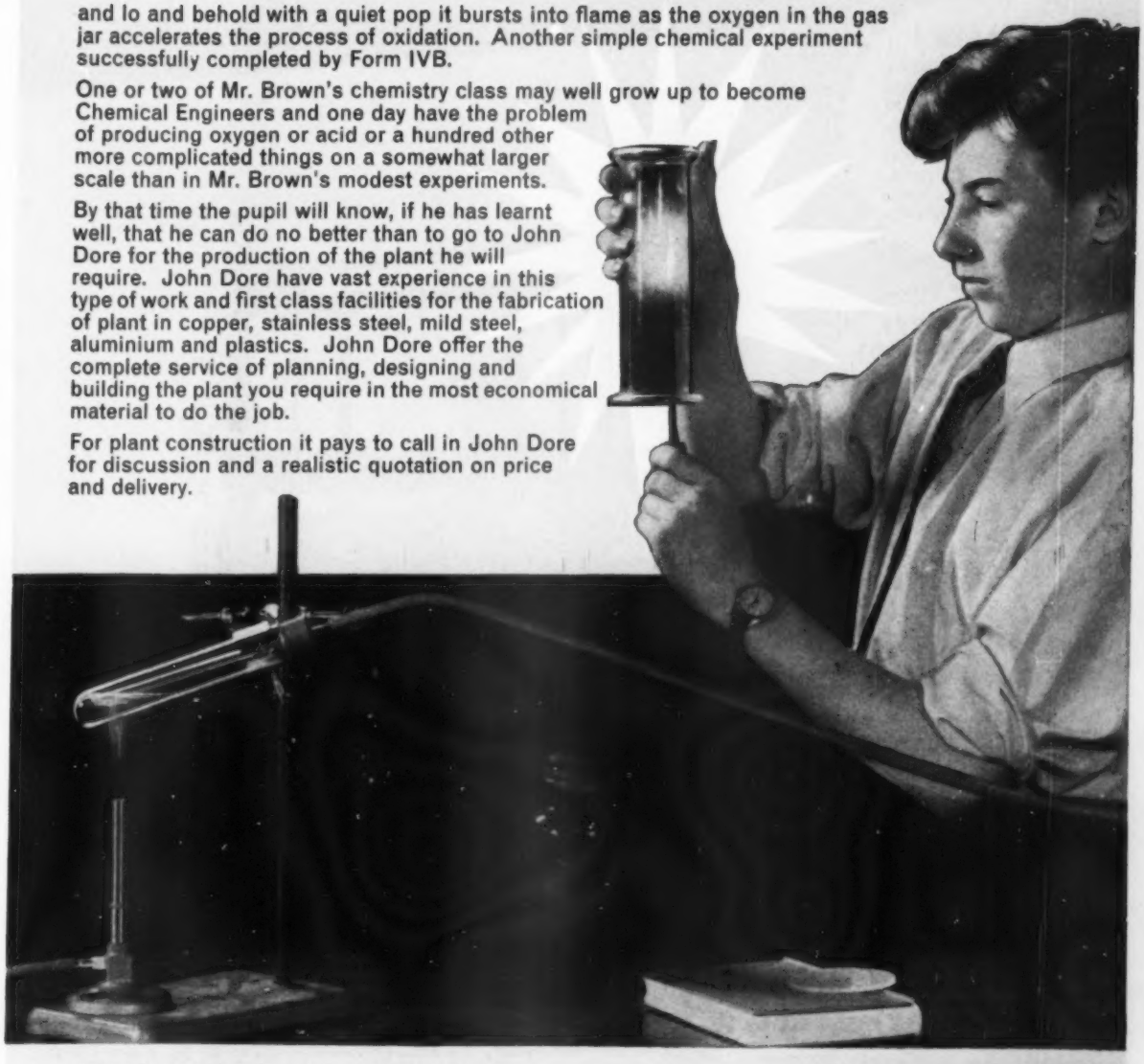

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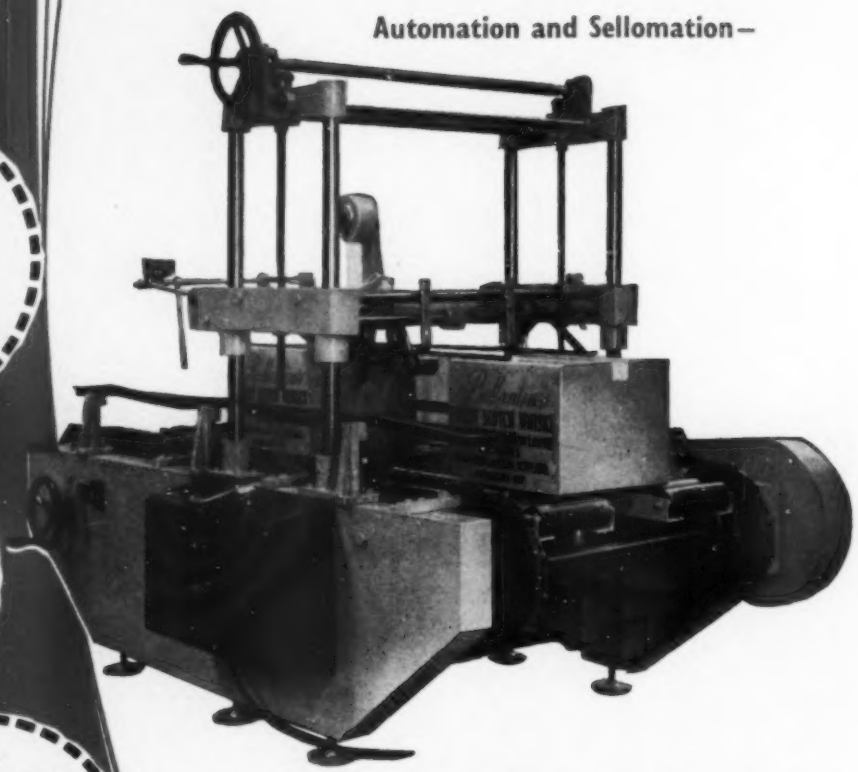

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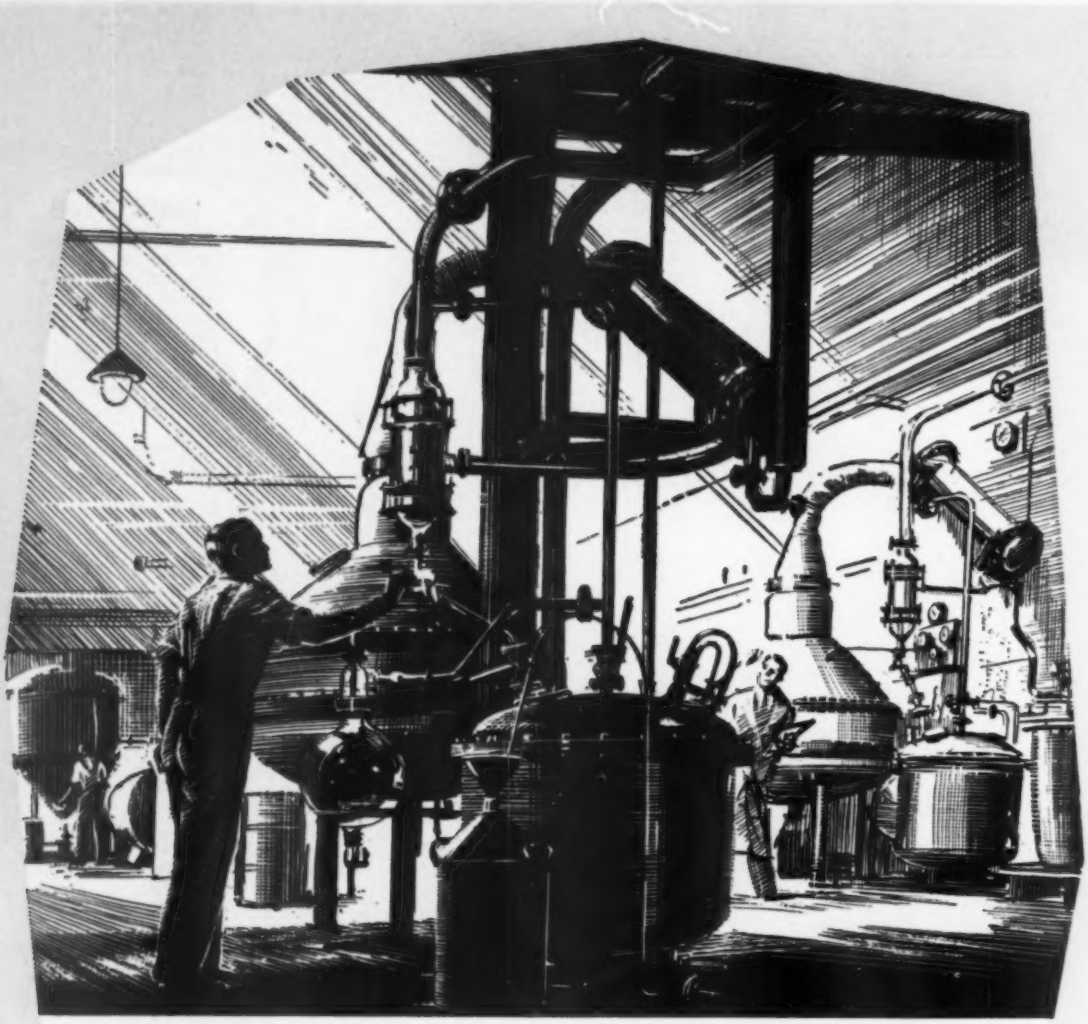

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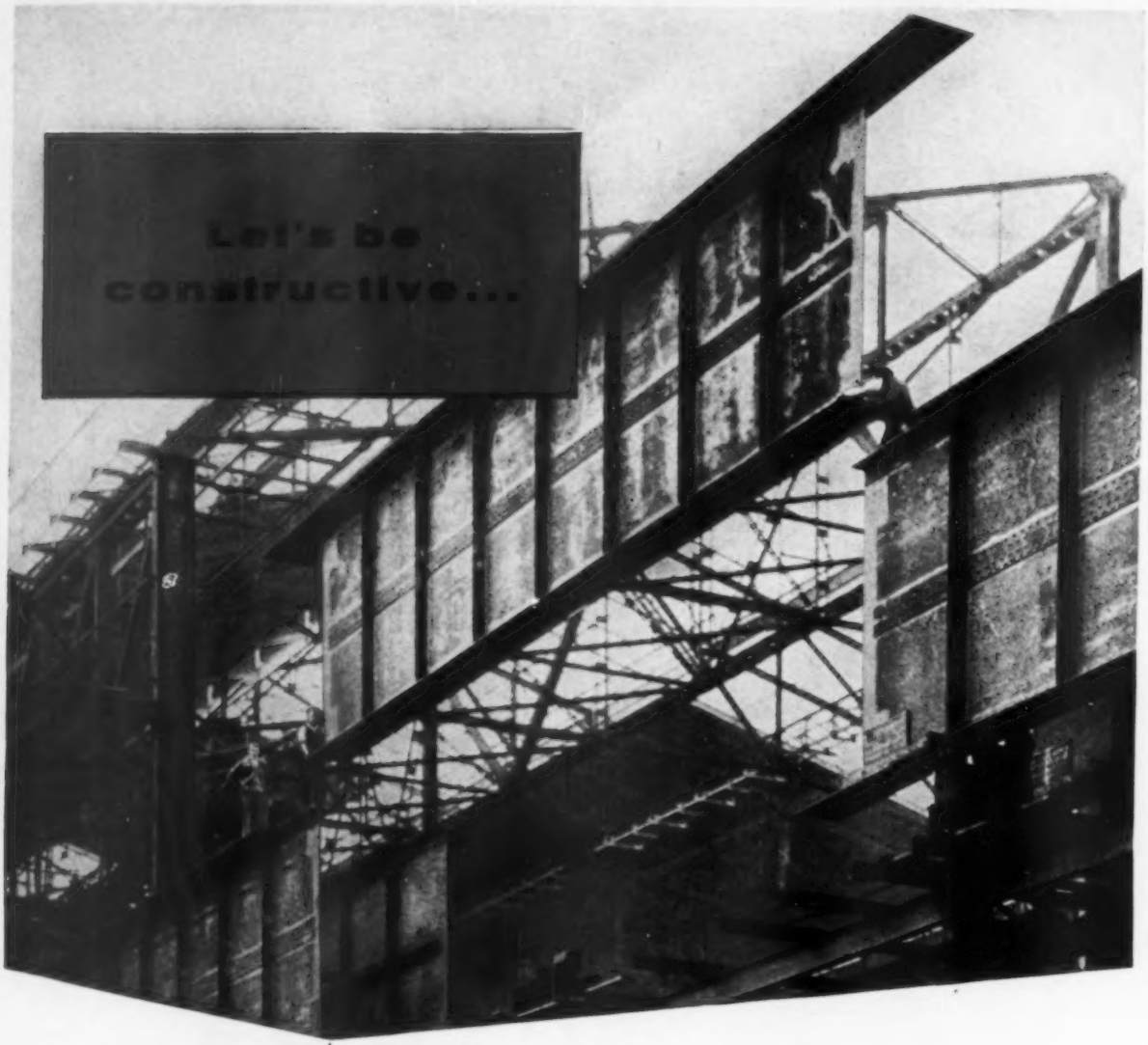

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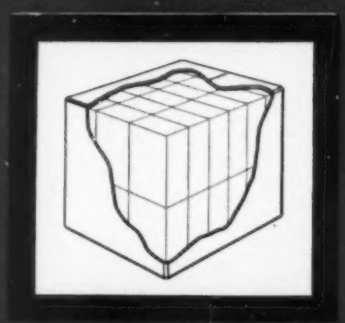

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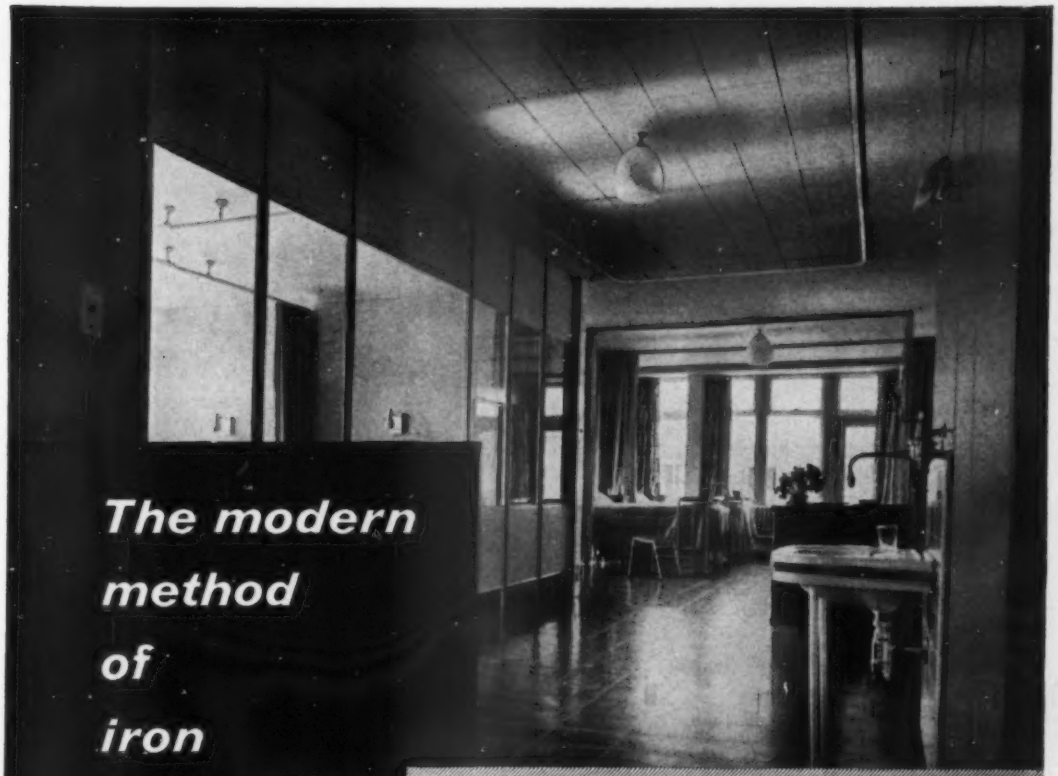

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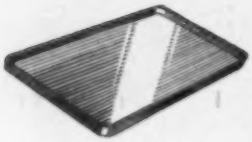

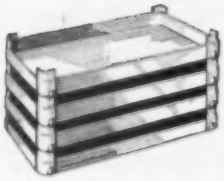

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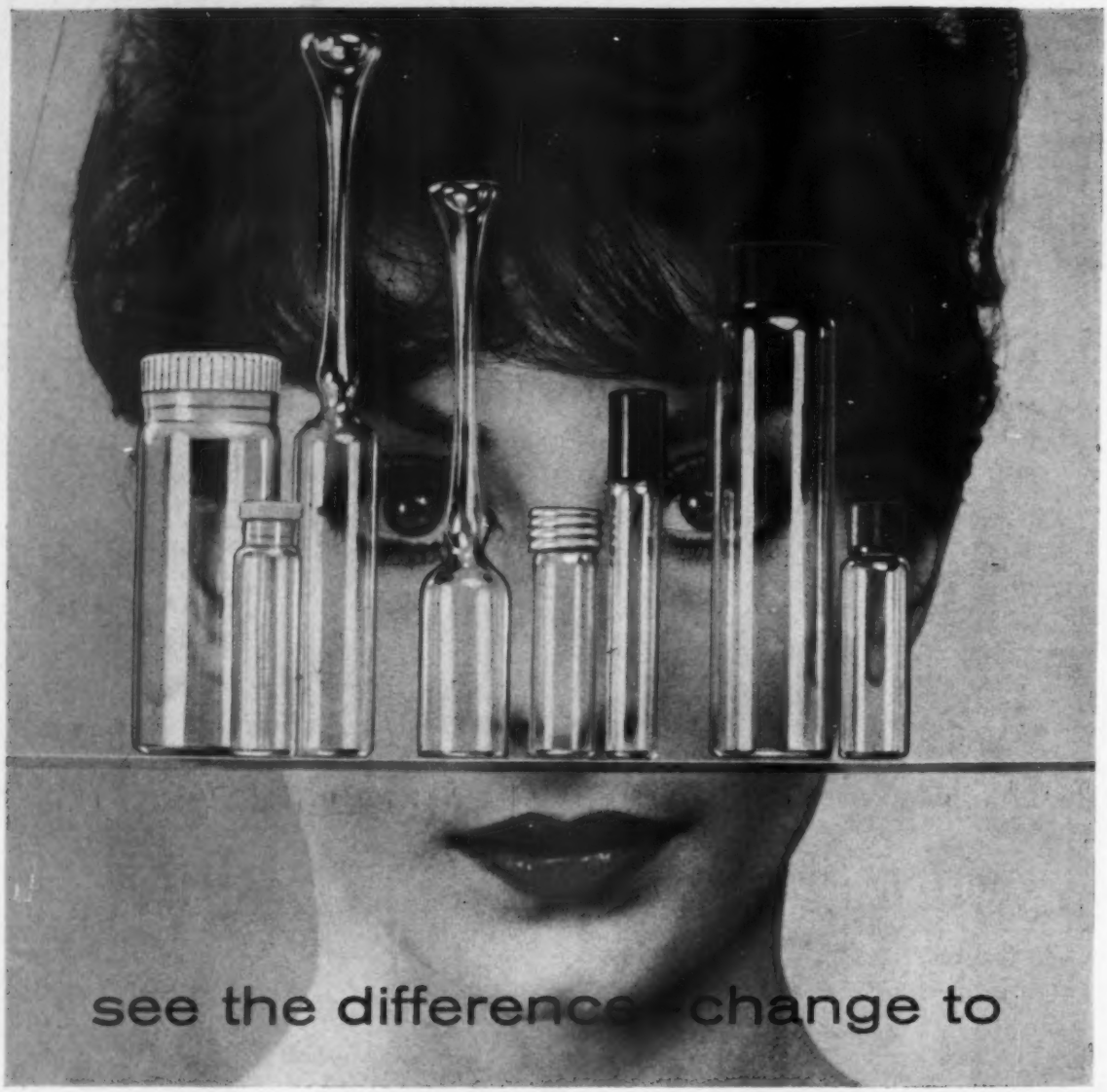

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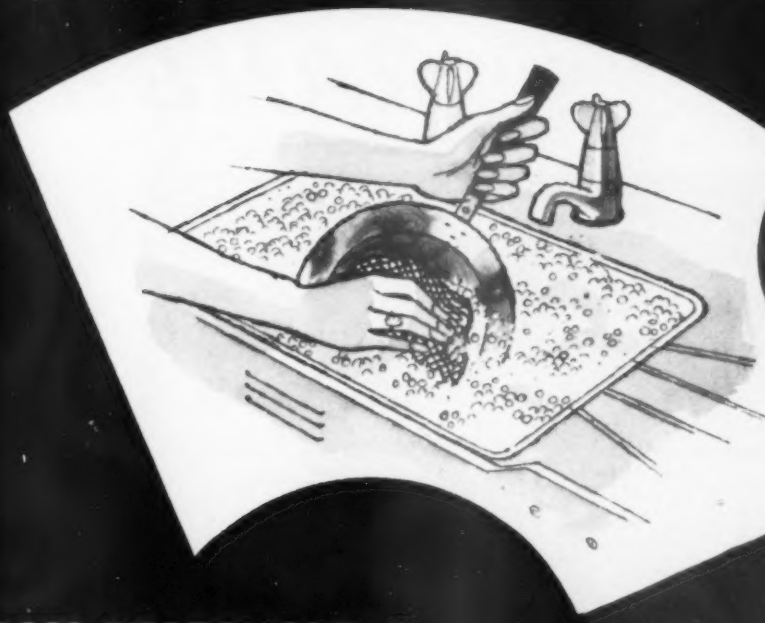

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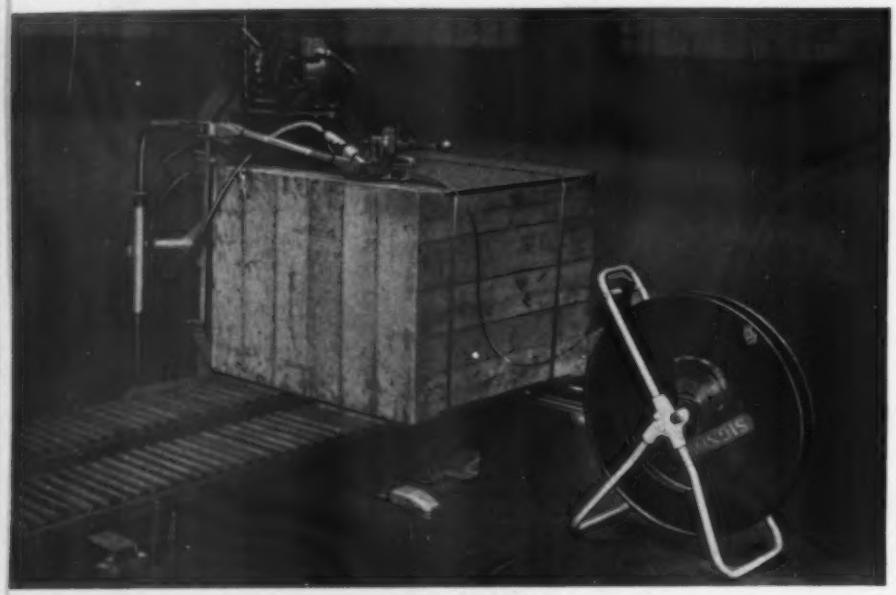

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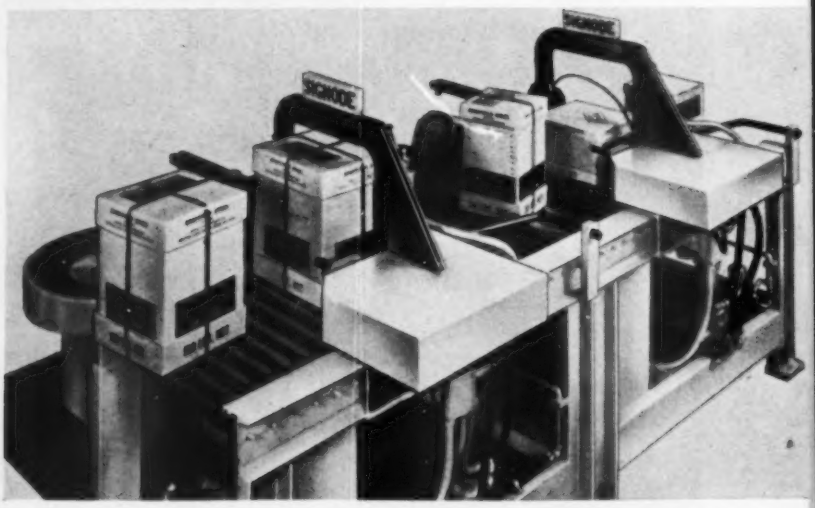

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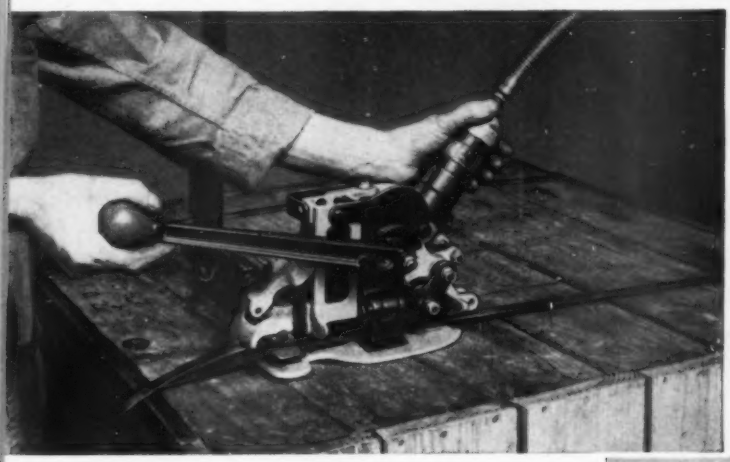

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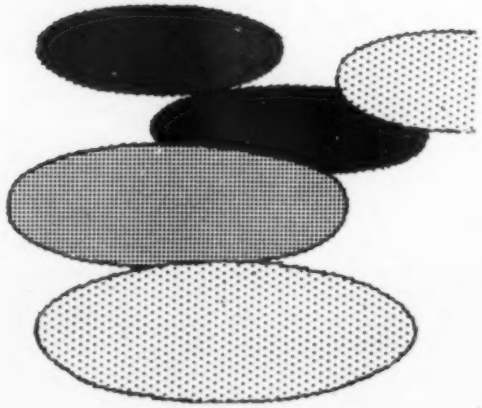

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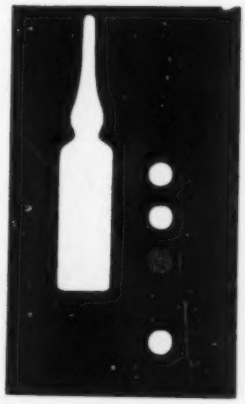

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Manufacturing Chemist

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TOPICS AND COMMENTS

Secrecy again

A COMPLAINT we have made in these notes on different occasions (see October 1957, p. 451) has been renewed by the Editor of *Chemistry and Industry*. In his August 1 issue he criticises the reluctance of certain firms to release facts that by no reckoning could be classed as trade secrets. "We wonder whether our industrialists fully appreciate how wearing this can be," he asks.

This obsession with secrecy is self-defeating. It makes it impossible for editors of technical journals to print a coherent and complete record of the capacity, achievements and aspirations of great industries. Thousands of people, here and abroad, depend for their knowledge of these industries upon the appropriate technical journals and judge their importance accordingly. The contrast between the reticence of the British chemical industry and the informativeness of the American chemical industry is too well known to need emphasis. The result is that the strength, versatility and inventiveness of the American chemical industry is projected all over the world. The British chemical industry has as good a story to tell and plenty of journals in which to tell it. A more co-operative attitude on the part of the industry would work a minor miracle.

Highlights and shadows

THE failure to create a European Free Trade Area was described as a serious disappointment to the British chemical industry by Sir Alexander Fleck when he spoke in New York recently to the American section of the Society of Chemical Industry. He said that the British chemical industry offered its full support to the free trade plan when it was first mooted because it would have opened up a compact, highly industrialised market of 250 million people—a market comparable to that of the United States. That this concept has not materialised is a blow to Britain's interests, said Sir Alexander, and he expressed the hope that eventually some form of co-operation would be found. At present the European Economic Community takes only a sixth of U.K. chemical exports compared with nearly a half for the sterling area. But the sterling chemical market is increasing at a much slower rate than the world market as a whole. This is why Britain's chemical exports, in line with Britain's exports generally, have decreased in terms of relative shares of the world market. That of the U.S., however, has remained fairly constant. Even though the U.S. exports only 6% of its total chemical output (Britain exports 21%), its share of world exports is 29%, substantially more than any other country's and just under twice that of Britain's. This indicates the fantastic size of the U.S. chemical industry; its gross annual output is worth over £8,000 million—Britain's is less than £2,000 million.

But to put matters in perspective, it must be realised that the U.S. has an immensely bigger home market than Britain. In the last 10 years America's population has increased by an amount equal to *half the total population of Great Britain*. Moreover, as Sir Alexander pointed out, British manufacturers have to pay roughly half as much again for electricity. Nevertheless, Britain has a compact home market and a compact source of that vital trio of raw materials—coal, lime and salt. And, in spite of the high bank rate and the strict control on new capital, the British industry has spent much more on chemical capital in relation to gross national product than the U.S. For the last three years it has exceeded the £100 million level and since 1950 the total amounts to about £840 million. British chemical growth in the past 10 years has, if anything, outstripped America's. We are using four times as much anhydrite for sulphuric acid manufacture as we did in 1950; our chlorine production has soared by 40%; nitrogen production has risen from 165,000 tons in 1946 to 825,000 tons in 1958, and at 24·8 lb. per cultivated acre the rate at which nitrogen is being applied to Britain's soil is three times the figure for the U.S.

These extracts from Sir Alexander's address, which is printed in the *I.C.I. Magazine*, shows there is much to be pleased about, in Britain's chemical growth—and not a little that is unsatisfactory. The most unpalatable feature is our failure to improve our exports. The answer lies in Europe.

Hair spray hazard

HAIR fixative sprays based on synthetic resins have proved to be hazardous. In the August 14 issue of *The Lancet* a case is reported of a woman aged 26 who complained of a cough and loss of appetite and energy for a year. An X-ray showed enlargement of the glands in the chest and mottling of the lungs and it was concluded that the cause was the inhalation of synthetic resins from hair sprays. The woman said that a year previously she had sprayed her hair daily for six months with two well-known brands of fixative.

This is an unexpected and alarming case. Apparently hair spray resins can produce inflammatory and tumour-like changes in the lungs, liver and other organs, and there is experimental evidence that they can produce malignant tumours in animals. Were these possible toxic effects of

synthetic resins investigated before they were used so freely in hair sprays? The case illustrates once more the scrupulous care needed before using new cosmetic ingredients. In this instance the onus lies on both the manufacturers of the resins and the manufacturers of the sprays. Users should be warned to use face masks before surrounding their heads with clouds of spray and to move out of the area of the operation as quickly as possible. The use of these sprays must be made as foolproof as possible, meanwhile steps should be taken to find non-hazardous substitutes for resins now used.

Caveat emptor

Some of our business friends are perturbed at the activities of the new *genus* "Management Consultant" which has proliferated rapidly in the last few years. These gentlemen offer to tell firms how to improve their internal efficiency and sharpen their external competitiveness. They claim to be able to bring to this work an impartial approach and a truly omniscient expertise and, naturally, they expect fees commensurate with their formidable talents. Our friends are naturally puzzled as to how complete strangers can walk into their factories and offices and tell them how to run them better than they have been doing for years. Perhaps we have heard only one side of the story. Perhaps these consultants can do what they claim to do. But our own knowledge and that of our friends leaves room for doubt.

An activity allied to management consultancy is the selection and placement of executives, scientists and managers. Some consultants do both, and again their fees are many times greater than those of the normal employment agency. One firm we know employed consultants to "reorganise" their business and one of the recommendations they received was that they should engage a kind of super salesman. The consultants went further and produced a candidate for this important job who was duly engaged. After some months our friends became extremely unhappy about the activities of this gentleman and began to make enquiries about him. It was discovered that one of the key reasons for engaging him was a testimonial written on the impressive notepaper of a well-known firm. This firm was consulted and they confirmed that the man had indeed worked for them for a few months. But when the testimonial was produced they pointed out that he had left them several months before it had been written. Closer inspection revealed that the "testimonial" had been written and signed not by a competent director or manager of the company but by another ex-employee who had written it several months after he had left the company. The letter was in fact completely worthless and in effect a fraud.

We hope that this unhappy business is only an isolated case, but it throws a most unfortunate light upon the activities of management consultants and "personnel experts."

Eye of newt . . .

Although, no doubt, the Elizabethans accepted as a matter of course the witches' compounding of "Eye of newt and toe of frog, wool of bat and tongue of dog" in *Macbeth*, it comes as a surprise nowadays to discover that extract of dried firefly tails is a sought-after and useful reagent in many types of biochemical research. The utility of the extract lies in its ability to detect minute amounts of adenosine triphosphate, a substance essential for muscle action, nerve transmission, brain metabolism and the conversion of food to useful energy in practically all living cells. When adenosine triphosphate is added to the extract of firefly tails light is produced in proportion to the amount of adenosine triphosphate present. By measuring the amount of light given off, the amount of adenosine triphosphate in a sample is determined, and study of variations in the adenosine triphosphate content of normal and diseased tissue may shed light on several medical problems.

To meet the need for dried firefly tails Schwarz Laboratories Inc. have organised collecting groups in areas in the United States where the insects are numerous. So far the scheme employs about 500 youngsters. The groups are organised under captains who are responsible for packing the fireflies in lots of 5,000 and dispatching them in dry ice to Johns Hopkins University, Schwarz paying the collectors 80 cents a hundred. The target for this year is a million fireflies, and in one week one of the most successful groups of collectors caught 85,000 insects.

Considering the improbability at first sight of firefly tails as a reagent, one wonders if there was not perhaps after all some subtle specific in the witches' unsavoury brew, a thought which opens up new fields of research for, say, a Ph.D. thesis. Alternatively one might tackle the mystery of how fireflies produce light from biochemical energy.

Sorting molecules with dextran

Swedish chemists have found a new use for dextran —the separation of molecules according to size. The method is called gel filtration and it was introduced at the 10th meeting of Scandinavian Chemists at Upsala in August. The inventors are Dr. Per Flodin of the Upsala drug firm Pharmacia, and Dr. Jerker Porath of the Institute of Biochemistry, Upsala University. Their studies were directed by the Nobel Laureate, Prof. Arne Tiselius.

Pharmacia introduced a dextran blood plasma substitute 10 years ago under the name Macrodex, and they have continued to explore the potentialities of this polysaccharide. Gel filtration is one result of these studies. The special form of granular dextran used is called Sephadex.

In practice, gel filtration works like this: Sephadex, which is completely insoluble, is stirred into water and swells to several times its original volume. The swollen grains are poured into a vertical tube,

where they are allowed to settle. Thus a bed of dextran is obtained suitable for gel filtration. A mixture of substances having different molecular sizes is passed through the bed; the larger molecules, which are unable to penetrate the dextran grains, will pass rapidly through the bed. The smaller molecules, being able to penetrate the grains, will leave the bed much later. Thereby a separation of the larger molecules from the smaller ones is achieved by collecting the filtrate in fractions. The bed returns to its original state immediately after the experiment and can be used again without delay.

The new separation method has been found useful for the fractionation of extracts of biological material and the purification of proteins, enzymes and certain hormones. Using the new method of separation, research workers at the Institute of Biochemistry are trying to prove the existence of a hitherto unknown hormone in the pituitary gland. This hormone regulates the balance of ACTH in the human body, which in turn affects the suprarenals.

Gel filtration has also proved successful for desalting substances of high molecular weight. Thus an additional method is now available for many tasks where dialysis has previously been employed. It is said to provide results of equal value in a considerable shorter time. The method has so far been mainly employed for laboratory purposes, but it is reported to be well suited to industrial use.

Patents have been applied for in many countries for the synthesis of Sephadex as well as for the use of this substance in gel filtrations.

Chemical rainmaking

THE ART of the weather maker has progressed considerably since some *shaman* in the distant past first flung water towards the heavens in the expectation that it would provoke a downpour. In fact, what was once an art and a mystery is now so far officially recognised that the National Science Foundation has recently initiated a programme in which $1,130,000 will be distributed in 18 grants for laboratory research, field experiments and conferences on meteorological methods directed towards modification of the weather.

Seeding of clouds over mountainous areas with silver iodide appears to result in measurable increases in rainfall, although over flat terrain positive results have not been obtained. Part of the grant will go towards the seeding of clouds from aircraft and investigation of the resultant physical changes in the clouds themselves, rather than in attempts to measure statistical departures in precipitation. In recent cloud-seeding experiments it was discovered that mean rainfall was approximately 80% higher on seeded than on non-seeded days, and that lightning flashes were about nine times more numerous on seeded days. Other research projects cover cloud electrification, cloud physics, the statistical evaluation of weather modification and freezing nuclei in clouds.

Although it is improbable that man will ever be able to produce fine weather to order, the ability to increase or promote rainfall may well lead to land areas at present unproductive being made fertile.

Progress in packaging chemicals

BECAUSE of the inherent hazards of industrial chemicals there has been, understandably, a cautious approach to changes in methods of packaging them. New ideas have had to be measured against fundamental principles, including a knowledge of the physical and chemical properties of the product and the various types of container with which it will be compatible, appreciation of the handling and transport conditions, and the safety of persons and goods likely to be in the proximity of the product. All costs—of the package, package filling, handling, storage and transport—must be considered also.

The oldest type of liquid container in current use is the glass carboy. The main change has been the use of automatic equipment to manufacture the carboy, thus reducing its weight, improving its shape, and providing a thread on the outside of the neck to take a screw cap closure. On compatibility alone the glass carboy is a good package, especially for highly corrosive and inflammable liquids. But it is essentially a returnable container, and when used for export there are high freight charges both ways. Many consider the carboy to be too heavy and bulky, too fragile and costly.

Developments of plastics make it appear that, in time, the glass carboy as we know it will be replaced by less vulnerable containers. Apart from the use of plastics in conventional packages there are now rigid and semi-rigid plastic containers, metal-clad polythene drums and plastic lined fibreboard cases or drums. None of these is yet the complete answer, but they are pointers to the future.

Another traditional container is the metal drum, mostly made in steel but also in tin plate, aluminium or black plate. Whether or not it is returnable depends on its price and the transport system available. Economics generally make it a returnable item, which is a severe handicap to the export trade. The trend must be towards light-weight, low-cost, non-returnable drums. Drums for heavy duty are constructed from mild steel sheet, the body and ends being welded and with the surfaces usually galvanised but sometimes lacquered after manufacture. Though essentially returnable, these drums are necessary for liquids which are corrosive or poisonous or develop a high vapour pressure. Gauge varies according to the use for which they are designed.

The present light duty drum is commonly used for most liquid products providing they are compatible with mild steel. Attempts are being made

to improve lacquered light-weight steel drums to contain corrosive liquids. Aluminium alloy drums are used for high purity products, such as industrial alcohols, resins and some detergents at a cost only a little above that of steel. Drums made from commercially pure aluminium are used for products which attack or are contaminated by mild steel. These drums are dearer than those made of steel.

Paper and fibreboard containers

MULTIWALL paper sacks have made inroads into what would otherwise have been a field for metal drums or jute sacks. The development of suitable handling and transport facilities and filling and closing equipment has accelerated the acceptance of the paper sack for both home and export products. Multiwall paper sacks are made of from two to six plies, according to the characteristics of the product to be packed. Two main types are manufactured. The open-mouth sack has an open top which is closed either by machine stitching or by using cord or wire ties. The valved sack is a closed sack with an opening at one corner through which it is filled.

The multiwall construction in the manufacture of paper sacks gives strength and flexibility, together with the opportunity of combining papers of different properties to give protection from various hazards. The scope of paper sacks has been widened by the use of plastic and foil laminates.

The jute sack has many desirable qualities, but to be economically sound it must be returnable and this does not appear to be feasible in the export business. Jute sacks are economic when there is a complete circuit for their return and re-use, or where, because of local conditions, they have a high second-hand value.

At one time a jute sack had the advantage of suitability for heavy loads, but with present mechanical aids there is less enthusiasm for lifting heavy weights by hand. The 56 lb. sack is a much more popular unit—a fact that nullifies the advantage jute had over paper.

Polythene coating and the circular woven bag have helped the jute bag, but while jute will remain in use for some products, the change to paper sacks will continue in the chemical industry.

The traditional timber case for chemical packaging has now been almost completely replaced by fibreboard and plywood. The staved cask is fast disappearing and the introduction of laminated and impregnated veneers for corrosive liquids and solids is being superseded by the developments in plastics and improved bonding techniques to metal and paper.

The wooden case still retains two advantages over the ordinary fibreboard containers. It retains its strength when wet, and it is capable of carrying heavier loads. These deficiencies are overcome by fibreboard cases incorporating weatherproofing resins, water repellent sprayed-on coatings, plastic linings and improved internal fittings. Research is being carried out to provide these properties at a more economic price.

Chemicals make cowards

CHEMICAL warfare, which used to be a messy business of making tons of mustard gas and bleaching powder, is quite different now. It went into eclipse with the advent of the atom bomb, but now it is being hailed as a way to win wars without firing a shot or causing a death. This vision of bloodless battles is conjured up by a report of the United States Congressional committee on science and astronautics. Psychochemical agents, says the report, can temporarily incapacitate men without permanent injury. Experiments with the new chemicals, the exact nature of which is not revealed except that some are derivatives of lysergic acid, so changed the behaviour of troops that they could not follow simple commands or perform simple tasks. And they were not even conscious of their abnormal behaviour.

The Americans are so taken with the idea of winning battles without death or destruction that they want to treble research expenditure on chemical and biological weapons. A good deal of this research, of course, will be concerned with protecting U.S. troops from new chemical weapons.

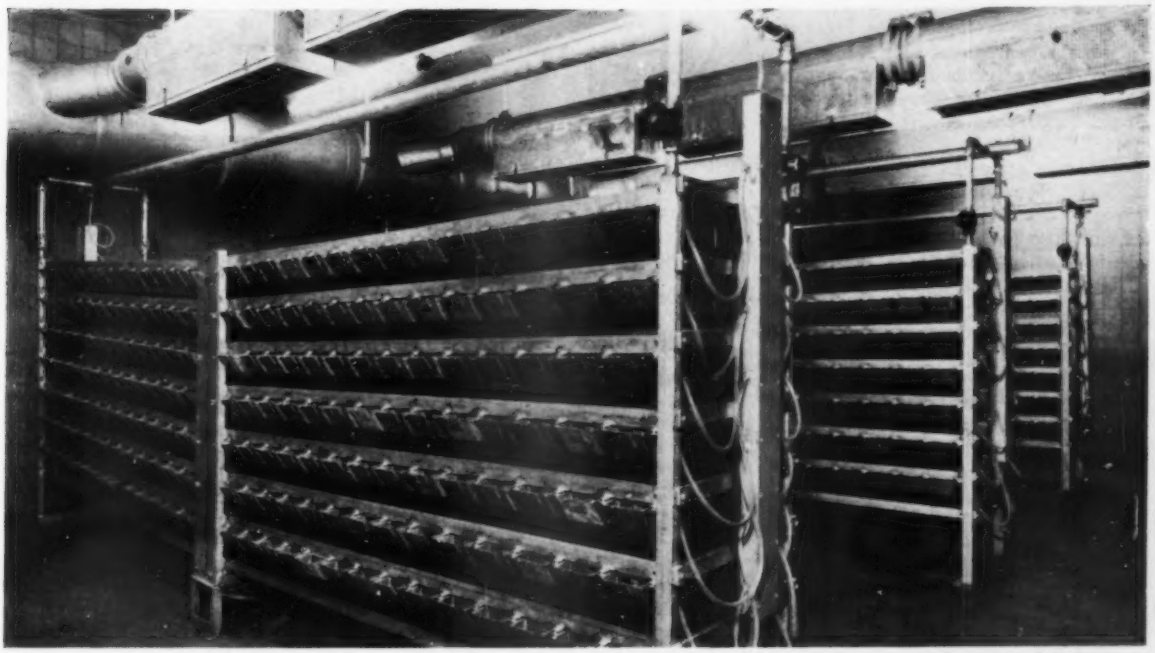
There are two groups of psychochemical agents, those which cause temporary physical disability such as paralysis, blindness or deafness, and those which produce temporary mental aberration. The two types of disability are referred to as "on the floor" and "off the rocker." Are the former strictly "psychochemical"?

Existing nerve gases can cause hallucinations in doses about half that which cause death. But the new psychochemicals are so potent that one-thousandth of the lethal dose can produce hallucinations. So there is a big safety margin. According to General Creasy, former chief chemical officer of the U.S. Army, it would at the moment be necessary to supply the same bulk of psychochemical agents as of mustard gas to produce a given result. But attempts will be made to simplify the logistical problem by making psychochemicals in more concentrated form. Presumably the problem of attacking troops with the new gases would be the same as with mustard gas, but a more subtle method is implied by the proposal that certain psychochemicals be introduced into the enemy's water supplies; apparently it would not be possible to decontaminate the water by boiling or chlorination.

Will the new weapons prove an effective means of humanising warfare, a way to

> Raze out the written troubles of the brain,
> And with some sweet oblivious antidote
> Cleanse the stuff'd bosom of that perilous matter
> Which weighs upon the heart?

Perhaps the chemist may yet find a way of ridding men's minds of the very idea of war.



One of the animal rooms at Alderley Park. Each cage has a drinking fount and underneath each rack of cages are long glass plates on which droppings fall and which are flushed down. These aids lighten the labour of feeding thousands of animals.

A New Venture in Breeding Laboratory Animals for Pharmacological Research

By D. G. Davey*

Rats, mice and other laboratory animals are the tools of the pharmacologist and the degree to which they are free from disease has a vital influence on the accuracy of his work of testing drugs. The Pharmaceuticals Division of I.C.I. has embarked on an ambitious scheme of breeding disease-free animals, which even includes sterile birth techniques. The elaborate and complex system now working at Alderley Park is described by Dr. Davey.

DURING recent years those who work with laboratory animals, particularly with rats and mice, have become increasingly aware of their diseased condition. What is surprising is that this awareness has taken so long to grow, which means that many workers for many years have been curiously uncritical of the tools they used.

Of course, the ill-health of the animals is not readily apparent, at least not superficially. Their coats do not obviously stare; and they scamper when disturbed, and breed when undisturbed, with facile ease. This is because the diseases we are now complaining of are not acute and devastating, but chronic and largely hidden. The whole picture is readily understandable. Every laboratory worthy of the name will see that its animals are fed and watered properly, housed under good conditions, and kept clean; but nevertheless they live cheek by jowl as it were, and whatever disease is present is given much chance of spreading. In other words, a dilution factor is either not operating, or operating only to a slight extent. Put a low ceiling over the whole of London and the diseases now affecting some people would quickly affect many. The fittest would survive — with chronic disease. To prevent such an occurrence means starting without disease.

The diseases the mice and rats carry become apparent when a stress is imposed upon them as when an experimental disease is given them; or when they are killed at the end of a toxicity experiment and a detailed examination is made of their tissues to determine what damage a potential new drug may have caused. At the end of such a toxicity experiment a pathologist is frequently posed with the problem of distinguishing damage which might have been caused by the compound from damage by intercurrent disease.

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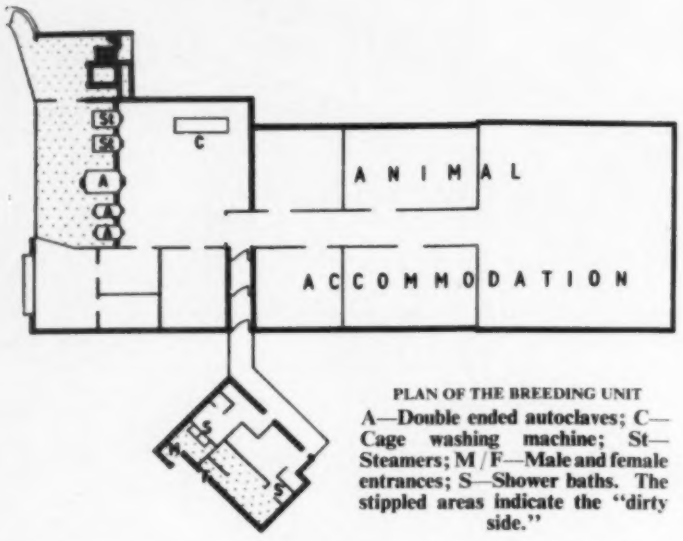
Preventing contamination

Several years ago research staff in the Pharmaceuticals Division of I.C.I. decided that they would try to rid themselves of this problem of natural disease in their animals at the first opportunity, and the opportunity came when they were given completely new laboratories at Alderley Park in Cheshire. There is much of interest in the design of these laboratories, not least in the special breeding unit. Breeding disease-free rats and mice demanded a special building because the presumption must be made that wild vermin carry the diseases which afflict the laboratory animals and therefore they must never be allowed to enter. More than this, the excreta of wild rats and wild mice must be prevented from contaminating the animals inside the building. The animals are fed on cereals (wheat, barley, oats) mixed with milk powder, vitamins, and minerals, all of which are compounded together into a pellet. The cereals, of course, coming from granaries, are almost certain to be contaminated with the excreta of wild vermin, and the contamination must be killed. Then again, many of the staff may keep animals at home, and they may carry on their clothes and on their persons dust from the cat, or bits of straw or hay from the horse, all of which is possibly contaminated, and therefore they must be given facilities to strip, shower, and dress in sterilised clothes before entering the animal quarters. Finally, insects must be kept out.

The scale of the building is big because about 1,500 rats and 5,000 mice are required each week for the work of the laboratories, and on such a scale everything could not be kept completely and absolutely free from every kind of bacterium and virus. But all that is thought necessary has been done to keep the inside of the building free from the contamination which is not wanted.

First, there is an absolute barrier between the dirty (outside world) and the clean (inside world) parts of the building. Everything, except people, entering the clean areas must go through double-ended autoclaves, where it can be subjected to heat to kill any contamination. The inner door of an autoclave, opening on the clean side, is not opened unless the outer door is shut and until a sterilisation cycle has been completed. The autoclaves also serve as the traps through which animals can be brought out. The animals are not cooked, of course, on their way, but the autoclave is not opened again on the inside until it has been sterilised once more.



PLAN OF THE BREEDING UNIT

A—Double ended autoclaves; C—Cage washing machine; St—Steamers; M/F—Male and female entrances; S—Shower baths. The stippled areas indicate the "dirty side."

Secondly, the pellets of food on which the animals are fed are made within the building. The raw materials comprising the cereals, etc., are received into a big steel chamber or "kettle" where they are kept churning round and round while they are heated sufficiently long to kill the unwanted germs. Then a valve is opened and the mixture is passed through a steel pipe in the floor to a "clean" area where it is pelleted, and from this area the pellets are sent to the animal quarters through chutes.

Thirdly, the "decontamination quarters" for the people working with the animals are in a separate building connected with the main building by an enclosed way. The quarters (separate for male and female) are in two parts, one leading to the other through a shower. The personnel strip in one part, take a shower, enter the other part and dress in clothes brought in through an autoclave. Then they walk along the enclosed passage and enter the main building through an air-lock of three doors. Insecticide is continually dispensed in the stripping area and in the air-lock. Ultra-violet lights are also continually on in the air-lock.

Windowless quarters

Some other points of interest in the building can be dismissed briefly. There are no windows to the animal quarters, and a twelve-hour-light, twelve-hour-darkness cycle is maintained throughout the year. Ventilation is by means of filtered and heated air carried by ducts throughout the building. Cages for the animals, and the racks to hold them, are original in design, and much thought was given to make them not only just right for the animals, but labour saving for the staff. In the whole building there are 13,000 cages. Normally each cage would carry a water bottle which would have to be filled each day and cleaned frequently. This gigantic chore was avoided by incorporating a system of automatic watering into the structure of the rack. It has also been arranged for most of the excreta from the animals to fall on a glass plate which can be flushed down.

"Unnatural" animals

Truly a special building fit for the special animals to populate it. And the animals really are special because they do not exist naturally, but have to be hand raised. There was possibly one laboratory in the world from which they could have been obtained to give the new work a start. This laboratory is in the University of Notre Dame, Indiana, where a small group of enthusiasts have been raising completely germ-free animals since the early nineteen forties. The I.C.I. workers decided, however, to do everything themselves, using much of the technique used at Notre Dame.

The concept of what they sought to do is simple to understand. Very few infectious diseases cross the placental barrier between the mother and her offspring, and none is known in rats. Some structural or functional defects are inherited through the genes, but these can be avoided by selecting the parents. The contamination of the offspring, therefore, that had to be prevented starts at birth through physical contact with the mother, the offspring breathing in the air she breathes out, licking her and becoming soiled with her excreta. To avoid it, natural birth must be side tracked and the babies taken from the mother by Caesarean operation and raised artificially. This is what was done—with rats.

Pregnancy in rats lasts a relatively short time, twenty-two days plus or minus a few hours. It is so short that a matter of about half a day in the timing of a Caesarean operation may make all the difference between success and failure to raise the offspring. This was learnt in many weeks of wasted work, and finally it was decided to sit by the bedside and wait for the first baby to be born before operating on the mother to take out the others. Rats average about ten babies in a litter and one could be wasted!

The babies were raised within the special building. They were fed on a diet consisting mainly of dried cow's milk reconstituted with water, and they were given a feed every three hours throughout the day and night. No success was obtained by allowing them to suckle at anything that could be devised, and therefore they were fed forcibly by pushing a small rubber tube down the throat into the stomach, and squirting the desired quantity of food into them from a syringe. A baby rat, when first born, is only about an inch long, and pushing a rubber tube into its stomach may seem to demand a great skill. Actually, although it is a delicate operation, it is not difficult and most people with reasonable control of their hands can learn to do it quite quickly. It had to be done many times because the baby rats were damaged if too much food was given in one squirt, and so each feed might be divided four or five times and the individual lots at intervals of ten minutes. About forty baby rats were being tended on each occasion, and the worker feeding them was lucky if he had more than a quarter of an hour in every three hours free from his charges. He had one little variation in his life. At least every six hours, and sometimes every three, he took a small camel's hair paint brush, dipped it in water, and cleaned up the other end.

The population of animals in the special building is growing. Sufficient rats have been bred to have a large breeding stock and animals are now being issued for experimental use. In addition, guinea pigs and mice, again specially raised, have been taken into the building. Nothing like this unit exists anywhere else in Britain, and perhaps it is the most ambitious of its kind in the world. Many eyes are on it, and there is little doubt that it has set a pattern for the future which will be followed more and more by those concerned with laboratory animals.

Technical Press Review—September

Chemical and Process Engineering Incorporating Atomic World.—Selection of Tower Packings; Review of Salon de la Chimie: New Urea Project in U.S.A.; Theory and Design of Pneumatic Transport Systems—2; Technology of Zirconium and its Alloys—1; Safe Handling of Dangerous Materials; Central Control in Coke and Chemical Plants.

Corrosion Technology. — Corrosion Resistance of Aluminium Bronzes; The Corrosion Products of Tin; Cold Emulsion Cleaning and its Application to Mass-production Lines.

Automation Progress. — Strain Gauge Load Cells as Industrial Weighing Elements; Wanted—An Educational Policy for Automation; Economic Aspects of Automation.

Petroleum.—Geological and Geophysical Methods for Modern Oil Exploration; Oilfield Development; Formation Evaluation; Chromatographic Analysis and Oil Exploration; Hard-facing of Drilling Gear; Applications for Analogue Computers; Instrumentation in the Petroleum Industry—3; East Europe's Petroleum Plans.

Paint Manufacture. — Packaging Review; Control of Gas-checking of Epoxide Esters; Mechanisms of Polymerisation; Aluminium Tubes for Paint.

Food Manufacture. — Radioactivity in Man and Milk; Spray Drying of Food.

Dairy Engineering. — Improving the Shelf Life of Milk and Milk Products—1; New Methods and Materials for Packaging Dairy Products; Vacuum Forming; Profile of an Australian Co-operative Dairy; Bulk Handling: The Modern Method of Milk Handling.

World Crops. — The Russian Tea Industry; The Machine in Tropical Agriculture—1; Preparing Land for Cocoa in Ghana; Chemical Taints in Arabica Coffee.

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Free films. Industrial and commercial organisations with a story to tell are increasingly using 16 mm. films to do it. The new Sponsored Film Catalogue issued by the G.B. Film Library, Perivale, Middlesex — Europe's largest 16 mm. distribution organisation—gives details of over 200 films available for free hire, some suitable for technical instruction, others of wider appeal. Films are listed under 19 subject categories ranging from Accident Prevention to Manufacturing Processes.

Pharmaceutical products. A spirally-bound 109 pp. book issued by Ciba Laboratories Ltd. indexes the properties and clinical uses of the company's preparations. Each entry gives the trade name of the product, together with its chemical name, properties, dosage, antidote for overdosage and the packages in which it is available. Products in tablet form are shown diagrammatically actual size, and details of colouring and whether coated or uncoated are given.

The book also contains a 10 p. sex hormone dosage section which describes the treatment with its underlying principle for a variety of conditions due to hormone over- or under-production. There is also an alphabetical list of indications.

Where to buy everything chemical. This useful directory, issued twice yearly, is divided into three parts: the buyers' guide for "general and fine chemicals," which includes some drugs, dyes and natural materials, occupies some 220 pages, that for plant, material and apparatus about 35 pages, and the list of trade names some 13 pages. Addresses and (in the buyers' guides) telephone numbers and telegraphic addresses are given under each heading. This makes for speed in use, but a separate alphabetical list of firms, with addresses, etc., and brief details of products, would be very useful and would save much repetition in the classified sections. At the price of 5s. this directory is good value.

Chemical Protection against Radiation

By M. J. Ashwood-Smith,* M.SC., MI.BIOL.

For all the effort which has been devoted to testing anti-radiation compounds no chemical has yet been found which gives a better dose reduction factor than just under 2. What is required is a compound which is non-toxic, preferably active when taken by mouth, and capable of giving a dose reduction factor of at least 5 for a period of several hours. At present no chemical even approaches this basic ideal.

AN account of the progress made in the study of chemical protection up till 1954 was given in an earlier article by Loutit.[1] Since that time there have been numerous reports of chemicals of widely differing structure which are capable of conferring varying degrees of protection against the lethal effects of gamma and X-irradiation in experimental animals. A comprehensive review of these agents has recently been prepared by Eldjarn and Pihl.[2] Only one compound, β, S-aminoethyl - *iso* - thiuronium bromide (AET) discovered in America during an intensive screening programme is sufficiently good to be considered as a possible challenge to cysteamine. Many of the other chemicals which have been described as protecting against ionising radiations are of academic rather than practical interest. Study of the pharmacology of these compounds has led to interesting speculation about their mode of action.

For most mammals the dose of X-irradiation which will kill 50% of an experimental group within a period of 30 days is between 500 and 700 rads (this dose is known as the LD50) and the effectiveness of an anti-radiation chemical is usually measured by the amount by which it will increase the LD50; this is expressed as the dose-reduction-factor. A chemical which when injected 15 min. before irradiation will increase the LD50 from 600 rads to 1,200 rads is said to have a dose reduction factor of 2. In the event of an atomic explosion a dose reduction factor of 2 would not make very much difference to survival chances, and it should be remembered that there are no chemical agents which offer protection against the effects of neutrons or *alpha* particles. Neither cysteamine nor AET produces dose-reduction-factors above 2 so that talk of a good radioprotective agent is purely relative.

It is usually considered that many of the biological effects of ionising radiations are caused by the action of free radicals on key cellular mechanisms. Free radicals are structures in which each of the atoms lacks a stable electron arrangement and in consequence they are very reactive. When water is irradiated several free radicals are formed one of which, the $H^{\bullet}$ radical, can combine with oxygen to form the very reactive $HO_2^{\bullet}$ radical. It is thought that this $HO_2^{\bullet}$ radical plays an important part when aqueous systems are irradiated with X or gamma rays in the presence of oxygen. Hydrogen peroxide is also formed under these conditions and it is interesting to note that any treatment, chemical or physical, which decreases the cellular oxygen tension at the time of irradiation diminishes the lethal effect of X or gamma rays. There are several theories which attempt to explain the action of protective agents but at the present time no one theory can offer an adequate explanation for all the different types of chemicals which possess radiation protective properties.

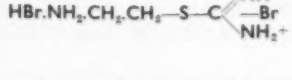
The biochemical effects of radiations

Many workers have attempted to show that radiation interferes with certain biochemical systems but much of the earlier work (see review[3]) is of no great importance as observations were often made too long after radiation exposure when numerous secondary effects interfere with the interpretation of results.

Perhaps the most remarkable event which has been demonstrated to occur after X-irradiation is a disturbance in deoxyribonucleic acid (DNA) synthesis. Ord and Stocken[4] have shown that both *in vivo* and *in vitro* the incorporation of radioactive phophorus into DNA precursors is inhibited even with doses of X-rays as low as 25r. This inhibition could be demonstrated in radiosensitive thymus and bone marrow tissue within a few minutes of irradiation. Exactly how radiation does this is not known but it is possible that when more is known about this very sensitive system a more rational approach to the whole problem of chemical protection against radiation will be possible. It is interesting to note that the first protective compound, cysteine, was discovered during an experiment designed to protect SH enzymes against radiation. Later it was discovered that these SH enzymes are no more sensitive to radiation then other non SH enzymes. Although the idea which led to the investigation of cysteine proved false the discovery that it was a protective agent stimulated an immense amount of research into the protective action of sulphur compounds and eventually led to the discovery of the effects of cysteamine by Bacq in 1951[5] and AET by Doherty in 1955.[6]

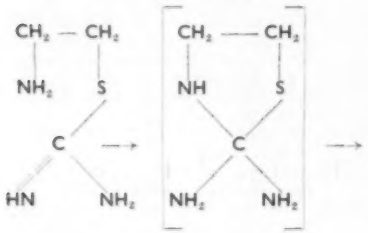
S,β-Aminoethylisothiuronium Br.HBr. (AET)

Mention has already been made that the only chemical other than cysteamine which has the ability to give a dose reduction of nearly 2 is AET. The fact that other sulphur compounds such as cysteine, glutathione, BAL, thiourea and cysteamine protected bacterial suspensions of *E. coli* against X-rays led Shapira, Doherty and Burnett to attempt a systematic modification of the cysteamine molecule and 74 compounds were synthesised and tested for possible radiation protective properties in mice.[7] The compound which showed the greatest activity combined with a low toxicity was S,β-Aminoethyl-*iso*-thiuronium Br.HBr, the formula of which is:

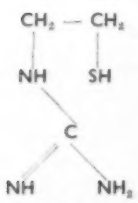


* Medical Research Council Radiobiological Research Unit, A.E.R.E., Harwell, Berks.

The chemical properties of this compound were investigated and it was found that at *p*H7 AET in solution gave an immediate and strong nitro-prusside test which was indicative of a free SH group. It was also observed that solutions of AET gave a positive Sakaguchi reaction, evidence of a guanido group. These results suggested that at physiological *p*H AET can intratransguanidate to form 2,mercaptoethyl guanidine. This intramolecular rearrangement probably takes place through the formation of a cyclic intermediate. These reactions may be summarised as follows:



AET



MEG

It was suggested that for high protective activity a thiol and guanido group must be together in one molecule, separated by not more than two or three carbon atoms. It was also suggested that only those mercaptoalkylguanidines which were capable of forming five- or six-membered cyclic intermediates would show the most radiation protective action. Various theories have been postulated to explain the protective action of AET. Doherty, Burnett and Shapira[8] advanced the hypothesis that AET reacts directly with free radicals to form resonance-stabilised hybrids which then react not with key biochemical components but with other less important radicals. A recent report[9] has presented evidence that AET inhibits a number of important SH enzymes of the rat *in vitro*. *In vivo* inhibition of pyruvate and a-ketoglutarate oxidation after the injection of sublethal doses of AET was also reported.

In 1958, Hope[10] discovered that the simplest member of the S-alkyl-*iso*-thiuronium salts, the S-methyl compound, had protective properties. Later work in this laboratory[11] indicated that the S-ethyl and S-propyl compounds were active. These results were surprising as molecular rearrangement in these simple thiuronium compounds is not possible. There are at least two possibilities which could explain their action. Firstly it was demonstrated[11] that liver contains a system which is capable of catalysing the formation of the alkyl thiol from the thiuronium compound and the thiol thus formed might be expected to show protective activity. The amounts of free thiol produced, however, were small and it would seem unlikely that this reaction could account for the protective activity of these simple *iso*-thiuronium compounds. A more probable explanation is that these compounds are hypertensive agents[12] and that they protect by producing local anoxia in radiosensitive tissues. Further investigational work has failed to reveal protective activity in other *iso*-thiuronium salts and it is probable that the activity of these compounds is limited to the S-methyl, S-ethyl and S-propyl derivatives, all of which possess the ability to raise blood pressure when injected.

Biological amines as radiation protective chemicals

It was shown in 1952 that tryptamine, β-phenylethylamine, histamine and adrenaline were capable of protecting lethally irradiated mice when injected before irradiation.[13] Bacq and Alexander, working with an *in vitro* polymer system, found that many aromatic amines protected it against the effects of X-irradiation and they suggested that *in vivo* animal protection with aromatic amines could be explained as a result of amine-free radical combination.

The injection of an aromatic amine is usually followed by changes in blood pressure and in the rate of blood flow through the different organs of the body. In some organs an amine will produce vasodilatation with a concomitant increase in blood flow, in others vasconstriction and a decrease in blood flow. A restricted blood supply leads to a limited oxygen tension with an increased resistance to radiation damage, so that any process which lowers oxygen tension in bone marrow, spleen or the gastro-intestinal tract is likely to increase an animal's chance of survival. Evidence has been produced, and is mentioned later, that many of these amines do in fact decrease spleen oxygen tension *in vivo*. The cardio-vascular changes which occur in the whole animal when an aromatic amine is injected are complex and arguments which have been used in the past to counter the pharmacological rather than the direct chemical radical combination theory have tended to over-simplify the issue. Histamine produces a general fall in blood pressure and tryptamine has hardly any vasconstriction properties and yet both these compounds protect animals, as do many other amines most of which increase blood pressure when injected.

Until very recently there was no direct evidence linking the pharmacological properties of an amine with its radiation protective ability. It was known that the injection of specific antagonists destroyed the amine protective action. Van der Meer and van Bekkum[14] have just published a very interesting study of the effects of various amines on oxygen tension in the spleen of mice. The spleen, an important organ in the hæmatopoietic system of mice, is very radiosensitive and damage to this organ as well as other blood-forming organs is one of the characteristic changes which occur in irradiated mice. By means of a polarographic technique it was possible, with a platinum electrode implanted in the spleen of an unanæsthetised mouse, actually to measure oxygen tension. The results of these experiments were very interesting as it was found that histamine, adrenaline, tryptamine and β-phenylethylamine but not nor-adrenaline produced a considerable fall in oxygen tension which could be correlated with the protective ability of the injected amine. Nor-adrenaline, which possesses no radioprotective action, had little effect on oxygen tension also. Van der Meer and van Bekkum also noted that the protective action of a number of these amines could be virtually abolished by the pre-administration of the requisite pharmacological antagonist.

Radioprotective action of serotonin (5HT)

It was discovered in 1952 that the hydroxyl derivative of tryptamine

was a powerful radioprotective amine *in vivo*. It was suggested by Bacq and Alexander that, in a similar way to tryptamine, it protected by combining with free radicals rather than by exerting any specific pharmacological action. There is a large body of evidence that serotonin plays a very important part in the physiology of the cardiovascular and central nervous systems. One of the properties of serotonin is its ability to constrict smooth muscle and elevate blood pressure. Recent papers by Hope[15] and van der Brenk and Elliot[16] on the protective action of serotonin indicate that it protects pharmacologically. These authors showed that the administration of two antimetabolites, d-lysergic acid diethylamide and its brominated derivative had no protective action but when these compounds were injected together with serotonin then the protective action of serotonin was abolished.

Langendorff, Melching and Ladner in a paper published[17] this year maintain that serotonin is a better protective agent than either cysteamine or AET. Nearly all protective chemicals have to be injected in doses approaching toxic proportions before good protection is obtained. Serotonin, however, is an exception as the dose which gives the best protection against X-rays is observed with doses considerably lower than the toxic dose[18]; in fact the protective action tends to fall off as the dose of serotonin is increased above a certain level. It is possible that this effect may be the result of the action of rather complex cardiovascular compensating mechanisms.

Chemicals which sensitise mammals to radiation

The best known example of compounds in this class is the vitamin K substitute, tetrasodium 2-methyl-1 : 4-naphthohydroquinone diphosphate (*Synkavit*). It has been used to potentiate the effects of X-rays in the radiation treatment of certain tumours in rats and human patients ([18a] and [b]). It has been shown by Phillips and Cater[19] that cysteine protects rats against an acute lethal dose of *Synkavit*. It is interesting that this thiol, which is a good radioprotective agent, is capable of protecting animals against the effects of a radiosensitiser.

Hagen and Koch have reported a new group of substances which sensitise animals to damage by radiation.[20] Two of these chemicals are isomers of α-homocysteine and cysteine, namely β-homocysteine and isocysteine. Three other radiosensitisers reported by Hagen and Koch were, thioglycol, α-methylcysteine and β, β, dimethylcysteinepenicillamine. It has been suggested by Pihl and Eldjarn[21] that many of the thiol protective compounds act by forming mixed disulphides with key cellular SH groups and thus protect them during radiation. The disulphide is then reduced leaving the key cellular SH groups in their original state. It is possible that the thiol sensitisers form mixed disulphides which are not easily reduced again.

Radiation protective compounds and hypothermia

Hope[10] has found that all radiation protective compounds lower body temperature when injected into mice. This hypothermia is often quite large, a fall of 6°C. within 30 to 40 min. It is not claimed that there is any direct relationship between hyperthermia and protection. In fact some chemicals will produce a marked fall in body temperatures without protecting against radiation, *e.g.* magnesium sulphate. It may well be that the hypothermia produced by many of these protective compounds is nothing more than a measure of a severe metabolic disturbance.

Chemical post-irradiation treatment

At the present time there are no chemicals which when administered after X-irradiation have any curative properties. There have been several claims but no confirmation has yet been forthcoming. Compounds which have been invoked include carbon monoxide, polyvinylpyrrolidone, batyl alcohol, properdin, lycopene and bacterial endotoxins. All the well-known radioprotective compounds are inactive when given after radiation. Mice which have been lethally irradiated can survive if injected with suspensions of cells from spleen but this is a biological rather than chemical post-irradiation treatment. Hollaender and Stapleton[22] have shown that some mice premedicated with AET and treated after irradiation with spleen injections survived doses of radiation as high as 2,400 roentgens of gamma rays.

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Electronic recorder. Cambridge Instrument Co.'s list 186 and supplement "A" are devoted to the model DE electronic recorder, a high-performance instrument with a full-scale response speed of better than 2 sec., a minimum range of 1 mV, a sensitivity of better than 1 μV, and an overall accuracy of better than ± 5 μV. It forms an integral part of the company's complete equipment for the measurement of temperature, gas concentration *p*H, conductivity of solutions, dissolved oxygen in feed water, strip width and thickness, radiation intensity, etc., and can be supplied for numerous other applications in industry and science.

Packaging Corrosive Chemicals

By C. H. Bulmer,* M.A., and S. T. Hurley*

What is the best type of package for industrial chemicals and other corrosive materials shipped in bulk? How can packaging and handling costs be cut down? What are the prospects for cheaper and more standardised packaging in the future?

THE best package for any commodity has been defined as the one which enables the product to reach the consumer in the best possible condition and at the lowest possible cost. In no field is this so true as the one at present under review, for whilst the manufacturer of consumer goods must take into account the "non-functional" aspects of packaging such as advertising value and embellishments, the "sales appeal" of a pack for industrial chemicals is the measure of its suitability for its purpose. In these days of expensive labour and mechanical handling one must take into account not only the mechanical strength of the package but also the ease with which it can be handled. With this in mind, it is possible to summarise the requirements for a package for corrosive products as follows:

1. Protection of product

(*a*) Mechanical strength to withstand hazards of transport.

(*b*) Safety to prevent spillage and pilferage.

2. Convenience

(*a*) Ease of filling and closing at manufacturer's works.

(*b*) Suitability for storage—economy of space during storage and transportation.

(*c*) Ease of handling and opening at customer's works.

(*d*) Ease of marking with essential information.

3. Shelf life

(*a*) Resistance to attack by product during transportation and storage.

(*b*) Contamination of product.

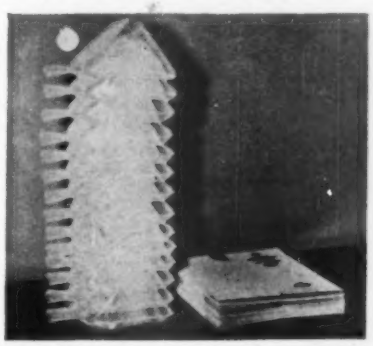
4. Cost

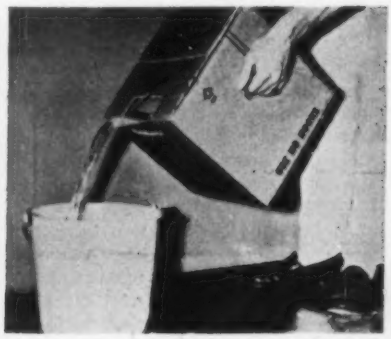
(*a*) Initial cost in relation to value of product.

(*b*) Re-use value, if returnable.

A little thought will show that many of these considerations can be met quite easily by following the rules and regulations which have been laid down by various authorities, and before reviewing the types of pack which are available it will be useful to point out that there are regulations laid down by the Railway Clearing House for rail traffic and the Ministry of Transport for sea traffic, while in the export trade most countries have their own rules, *e.g.* the Interstate Commerce Commission Regulations of U.S.A. and Canada. These various regulations give guidance as to the type of package which can be accepted and also provide information about the labelling of containers, which is a matter of great importance not only to the ultimate user but also to persons who have to handle the package during their normal work. These people are frequently not familiar with the properties of the various chemicals and it is essential to provide them with information about possible dangers and precautions to be taken in the event of breakage or personal contact.

* Printing, Packaging and Allied Trades Research Association





"Cubitainers" by Iridon Ltd.: (*left*) a stack of empty containers; (*right*) one in use.

Turning now to the types of package in common use, they can be subdivided into four main types which will now be dealt with under separate heads.

Drums

When it is desired to pack corrosive materials in drums it is usually necessary to provide the drums with an adherent coating or a detachable plastic liner. A great diversity of coatings is available, to provide one or more of the following properties:

Abrasion resistance. Provided by vinyl, alkyd-melamine, chlorinated rubber, epoxy- and epoxy-phenolic types.

Acid resistance, e.g. vinyl, chlorinated rubber, hydrocarbon, phenolic and acrylic coatings.

Alkali resistance, e.g. vinyl, hydrocarbon, acrylic, epoxy, styrene and melamine-formaldehyde types.

Water and salt resistance, e.g. vinyl, chlorinated rubber, acrylic, phenolic and epoxy-phenolic types.

Phenolic materials provide a good general-purpose coating, but are not suitable for strong alkalis. Vinyls are thermo-plastic and solvent soluble, which limits their use, but they are excellent for mild acids and alkalis, Epoxy coatings have a wider range of use than phenolics, are more flexible, and are less easily damaged by reverse impact and metal fabrication. Of the other plastics polyamides and polyesters have not been used to any great extent, and cellulosics are generally unsuitable because of their water susceptibility.

When one is applying a coating to a metal surface it is essential to ensure that the surface is correctly and thoroughly pretreated. Many failures can be attributed to neglect of this simple precaution. A coating will often break down rapidly because the metal surface is not free of rust, dirt or scale. After cleansing it is advisable to phosphate the

metal surface to improve adhesion and insulate the organic coating from reactive metal oxides and corrosion products. After phosphating, a coating suitable for the product to be packed can be applied by hot or cold spray, electrostatic spray, brush, flow coating, whirl, tumble or roller. Curing is effected by solvent evaporation, oxidation or polymerisation, and the finish is usually stoved.

Detachable plastic liners for drums have been available for some years, and polythene is by far the most popular material. The first moulded, seamless polythene drum encased in an open head steel drum was produced in the U.S.A. about 15 years ago, and all sizes from 5 to 55 gal. can be obtained.

The advantages of polythene in this field are chemical inertness and low cost. Substances which are highly corrosive to metals but do not affect polythene at room temperatures include chromic acid solutions of any concentration, 100-vol. hydrogen peroxide, fluorine in water solution, ozone, 90% phosphoric acid and 50% sulphuric acid. Polythene drums made by a modified blow-moulding technique will withstand a hydrostatic pressure of 25 p.s.i. and only require 2% ullage—an important freight saving.

Carboys

The glass carboy has long been the standard container for corrosive liquids, and is now machine-made to close tolerances as laid down in B.S. 678. The greatest advances in post-war years have been in design and in closures. The new, 5-gal., straight-sided carboys not only show important freight savings but are easier to protect than the older, globular 10-gal. type. The introduction of the externally threaded neck made it possible to use a double closure, consisting of a cork covered by some form of screw cap which can be made resistant to corrosion. Glass manufacturers are able to provide a straight-sided 10-gal. carboy which would enable further economies in freight costs to be made.

In spite of these developments the glass carboy still presents a difficult packaging problem and, where conditions permit, many companies are turning to plastic bottles, especially polythene. With polythene continuing to fall in price the trend can be expected to increase. The chief advantage of polythene is its great resilience and, while reduced breakages due to impact are partly offset by increased punctures, the overall reduction in losses is quite large.

"Armadillo" container by Reads Ltd. It has a reversible spout.

A polythene carboy contained in a plywood case has been extensively used for 60% aqueous hydrofluoric acid, and also for hydrochloric and hydrofluo-silicic acid.

Perhaps one brake on progress is that these containers are not cheap enough to be used as non-returnables except in the export trade.

Collapsible plastic containers

A pack which has been very favourably received in America consists of a collapsible plastic container inside a fibreboard case. The best known version is the *Cubitainer* which utilises a polythene inner container. It is fitted with a filling spout, which is heat sealable and is used as a pouring spout during use. Containers are at present available in quart, 1-gal. and 5-gal. sizes. Such packs offer substantial advantages over the traditional packs for liquids, not least being the large reductions in storage space required for empties. They appear to offer the best hope at present of a non-returnable container, but it appears that they cannot yet compete with carboys and drums on terms of cost per journey.

Paper and jute sacks

The paper sack is a container which has come very much to the fore in the post-war years, and with improvements in plastic coating techniques a much wider range of products can be accommodated. At the present time shipping companies are unwilling to give a clean bill of loading to hazardous products packed in paper sacks. The sack is a useful cheap container for powdered and granulated products, but before it can be freely accepted for dangerous chemicals there are a number of problems to be overcome, notably with regard to a 100% siftproof closure. The best answer so far is the separate polythene inner ply which can be heat sealed.

The paper sack goes a long way to meeting the requirements listed at the beginning of this article, and one of the things which is holding back development is the absence of British Standards for construction and performance, without which shipping conferences will be unwilling to accept it into international trade without reservations.

Future developments

Packaging materials are so diverse that it is always difficult to try to forecast the ways in which a particular section of the industry will develop. Whilst new materials may appear overnight, to be heralded as the answer to all problems, prolonged trials often find them wanting in many respects. It would appear at first sight that the developments in the plastics industry, leading to cheap plastic bottles to replace glass carboys, and acid-resistant coatings on metal drums, have already provided answers to many problems, and no doubt their use will increase.

One material worthy of particular mention is the type of polythene produced by the low-pressure Ziegler process. This material possesses greater rigidity and heat resistance than the conventional form, as well as exceptional chemical resistance and impact strength, making it particularly suitable for the manufacture of carboys for strong acids, alkalis and detergents.

But there are other facets to the packaging function which provide equal scope for improvements and money saving. One of these is undoubtedly through improved materials-handling techniques. The use of fork-lift trucks and pallets

is now commonplace, but how many are working to capacity? The efficient use of such equipment implies the use of standard packages, tailored to fit pallets exactly, as well as to contain the required quantity of product. The problems are enormous, for products vary greatly in their bulk densities, and the trade has become accustomed to dealing in certain traditional weights, but with co-operation among chemical manufacturers, users and package suppliers, it should be possible to reduce the number of sizes of container at present in use. The metal drum manufacturers have already given a lead and *Cubitainers* are to be produced in standard sizes. There is a British Standard for pallets, which lays down a small number of sizes, at least two of which have already been adopted as International Standards and, with the coming of the European Free Trade Area, the importance of standard containers which can be freely used in all the countries concerned needs no emphasising. In addition, there are the immediate financial benefits of cheaper containers to be gained, since with standard packages, manufacturers' machines can work longer runs, with less time spent in machine setting, and more economic use of base materials.

There are two ways to cut the cost of packaging which are worthy of mention. One is by reducing the weight of containers, and the other is by increased use of non-returnable containers. Usually the weight of a container is included in the cost of transport, and can account for 20% or more of the weight of the consignment. Bottles in wooden cases are particularly bad. A 5-gal. bottle plus case could weigh 20 lb. and contain only 50 lb. of liquid. Returnable containers are usually bad in this respect, and there are storage and accounting charges to be met. A paper sack, on the other hand, occupies little storage space, weighs about 1½ lb. and will carry 112 lb. of product.

Thus, even when the main characteristics of the package to be used have been decided, there are still many minor considerations with scope for reducing costs and, if attention is paid to these points, then many users will be spared the expense of installing bulk handling systems.

Improved Labelling and Sealing

By Frederick T. Day

Good labelling adds the final touch to good packaging. It enhances the sales appeal of a pack and, in the case of hazardous chemicals or fragile goods, it is an essential safety factor. After considering the basic types of labelling, the author discusses such innovations as heatseal and self-adhesive labels.

SEVERAL forms of labelling are employed for bulk packed goods and the process chosen will depend upon the form of the container used. Fibreboard cartons and containers, wooden cases, kraft wrapping papers, hessian and like materials are used for packing goods in bulk.

In this field there are four main types of labelling:

No. 1. A plain paper, white or coloured, printed with details of manufacturer or sender's name, address and trade mark, applied to the package with an adhesive, usually by hand. Suitable types of packages may be semi-hand and machine labelled and in some cases labelled by fully automatic machines.

No. 2. Pre-gummed label papers in white or colours, supplied by the printer in individual labels, perforated on the reel or in some other form ready-to-use. Pre-gummed label papers are available which stick fast to metal surfaces, to tin, iron, lacquered and bright surfaces, wood, leather and most other surfaces used in bulk packing. Tropical pre-gummed papers are made to label goods for export and such labelling will stand up to hot and damp conditions. Also available are pre-gummed papers which stand up to freezing conditions.

No. 3. Waterproof ink and stencil labelling is popular in factories where wooden cases are used. Cut-out stencils produced on the Diagraph are used for addressing bulk supplies of goods.

No. 4. Tags, tallies and metal seals are used where goods are packed in hessian and other cloths. Labels may be stitched, wire bound or sealed on to each individual package. Tags are made of strong linen or manilla.

Fundamental requirements

Design and style are important for product labelling. Even the everyday merchandise label should be attractively designed and printed. Here are the main factors to be considered in all forms of labelling:

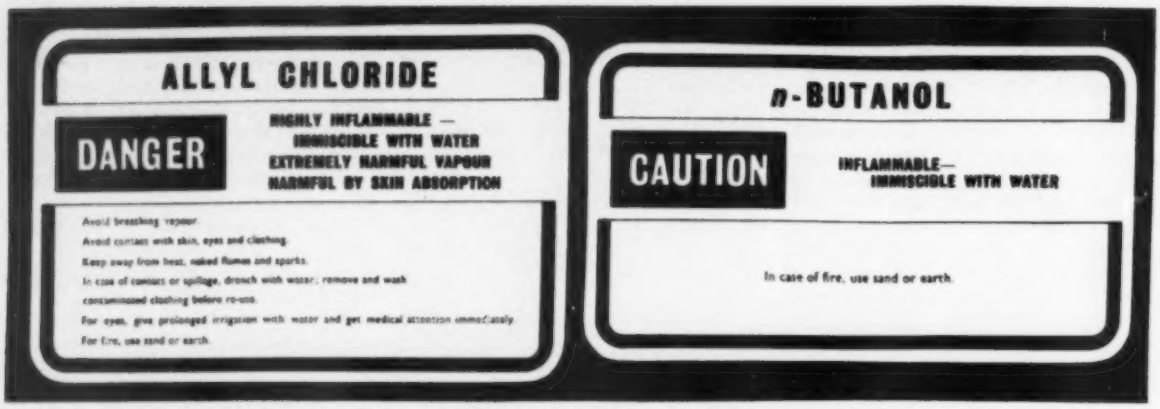
A. Choose a good design and print on a material tested and best suited for its adhesive qualities to the surface to be labelled.

B. Colour should permit ready identification. A label printed on a tinted paper gives a two-colour effect for the cost of one printing.

C. Choose the best paper for the purpose, *e.g.* metal paper labels for fancy goods, linen and manilla labels for strength, and so forth.

D. Choose the best adhesive for bonding where plain paper and glues are employed. Clean and accurate application of label to surface where applied by hand.

Colour and shape are important. Kodak's yellow, Reckitt's blue and Colman's yellow labels help to identify the product immediately. Shape may also be considered for eye appeal; many labels are square or rectangular, but those which follow the shape of the container look very attractive. The label specialist holds a stock of attractively shaped punches so that diamond, hexagonal, round and other types of label may be planned at little or no extra cost.


ALLYL CHLORIDE
DANGER
HIGHLY INFLAMMABLE — IMMISCIBLE WITH WATER
EXTREMELY HARMFUL VAPOUR
HARMFUL BY SKIN ABSORPTION
Avoid breathing vapour.
Avoid contact with skin, eyes and clothing.
Keep away from heat, naked flames and sparks.
In case of contact or spillage, drench with water; remove and wash contaminated clothing before re-use.
For eyes, give prolonged irrigation with water and get medical attention immediately.
For fire, use sand or earth.
n-BUTANOL
CAUTION
INFLAMMABLE— IMMISCIBLE WITH WATER
In case of fire, use sand or earth.

Two designs for warning labels suggested by the Association of British Chemical Manufacturers for use on containers of dangerous chemicals.

Labelling dangerous chemicals

The marking of containers containing hazardous chemicals is dealt with most comprehensively by the Association of British Chemical Manufacturers in their special instruction manual (price 10s.). A simple and uniform system of warning labels on containers provides valuable and continuous information at all stages in the journey of goods from the packer to the ultimate user. Existing labels should be checked against examples shown in the A.B.C.M. manual.

The warning markings recommended are intended to be used in addition to, or in combination with, any markings required by, for example, the following ordinances:

Explosives Acts 1875 and 1928.
Food and Drugs Act 1955.
Petroleum (Consolidation) Act 1928.
Pharmacy and Poisons Act 1933.
Lead Paint (Protection against Poisoning Act) 1926.

The Railway List of Dangerous Goods and Conditions of Acceptance by Merchandise Trains also imposes special requirements, as do the Merchant Shipping Act 1894 and other shipping regulations in this connection.

Heatsealing

An outstanding development in labelling and sealing products of all kinds is heatsealing or heatfixing. Products may be wrapped, sealed and labelled in two ways:

A. With a viscose film or a film with inherent or added heat-sealing properties such as cyclised rubber, rubber hydrochloride, polythene or cellulose. These materials may be heat-sealed with equipment ranging from a simple hand hot iron or hot plate to a fully automatic machine.
B. With labelling papers coated with thermoplastic resin which can therefore be easily softened by moderate heat to stick to metals, paper, cloths, viscose film, certain plastics and so forth.

They may be applied by pressure and heat affording a permanent label, seal or bonding for the package. Current packaging machinery may be supplied with units to deal with heatsealing methods.

Heatseal coated papers fall into two main groups:

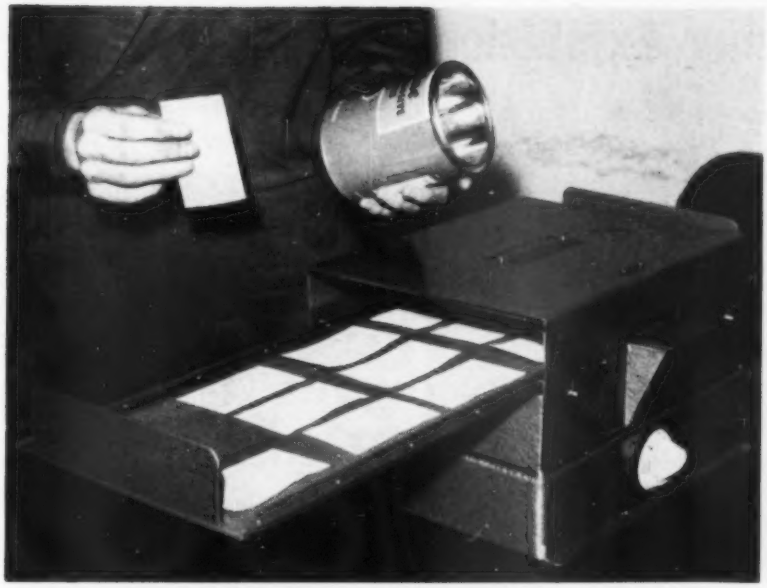
A. Instantaneous or *Imatac*. These papers are activated by heat while in contact with the package or article to which it has to adhere. When the source of heat is removed, the adhesive cools and sets almost instantaneously. Labels must be accurately placed as they may not be removed after application.
B. Delayed action or *Delatac*. When this type of label is heated, it retains its adhesiveness for some minutes. The advantage is that the label may be pressed into the approximate position and moved with cold rubber pads so that fragile and heat-sensitive products may be labelled without damage.

This second type of paper has enabled machines to be designed in which the heating is separate from the application of the label. By so reducing the time lag, in this labelling process, an increase in production is obtained.

Heatseal labelling makes it unnecessary to maintain continuous adhesive supplies in the machine. The absence of water in the process obviates wrinkling or cockling of labels and the labels are applied cleaner, neater and in most cases quicker. Speeds are claimed to be two or three times as fast as with ordinary adhesive labelling. A greater variety of surfaces may be dealt with and the bond is permanent and neat. There is no residue and heatseal labels and seals may be safely used for products that are water sensitive. Soft products are not damaged as there is no need for high-pressure labelling. The resins used in the coatings are not water soluble so that the labels are waterproof.

Labels may be removed, as in the case of returned empties, with a suitable detergent.

Heatseal labelling is slightly dearer than conventional labelling, but this is offset by the advantages enumerated. The printing and handling of heatseal labels is much the same as with ordinary grades of pre-gummed labels, but in printing care must be taken that inks are not used whose solvents " activate " the coating on the paper. Inks susceptible to set-off must be avoided as this will slow down or even prevent adhesion. Letterpress or litho printing both give first-class results. The labels must be stored under proper conditions of paper storage, *i.e.* no extreme damp or heat. However, the paper itself is much less susceptible to humidity than plain paper.



Heatseal label papers used with a Funditor label activator.

Heatseal papers for tropical labelling are made with high melting-point resins. The standard grade begins to block at 140°F. and it is normally tacky at 180°F. The temperature of the activating unit is sometimes up to 100°F. higher.

Self-adhesive labels

These labels developed from pressure-sensitive tapes which are applied without moisture or heat. They are merely pressed on and may be peeled off without leaving any residue. They are suitable for pricing, branding, coding and sealing up to the point of sale. They are made of paper and linen base materials and are supplied with a backing sheet which is peeled away upon application. They may be supplied in any shade or size, or printed in white or colours. The latest type of self-adhesive label is called *Tacktite* and it adheres on pressure and sticks permanently.

All self-adhesive labels may be supplied as separate labels, in sheets of labels or in continuous reels for machine application.

Transfer labels

Transfers are used in particular by the chemical, pharmaceutical and cosmetic industries for labelling bottles and jars. Because they are transparent they do not hide the contents of the bottle. They look their best when applied to bottles of coloured liquids. Transfer labels of the slide-off variety are usually applied by hand. The label becomes a permanent feature of the container or article. They look their best when their shape conforms with the shape of the container or bottle.

Glossy finishes

After printing, most types of label papers may be treated with a coating of varnish, nitrocellulose or the new superplate high gloss finish. Most attractive labels may be produced in this way.

In addition to the attractive high gloss the finish makes the paper waterproof, dirtproof, scuffproof and finger proof. Many label users are now employing this treatment to improve their packs.

PACKAGING EXHIBITION

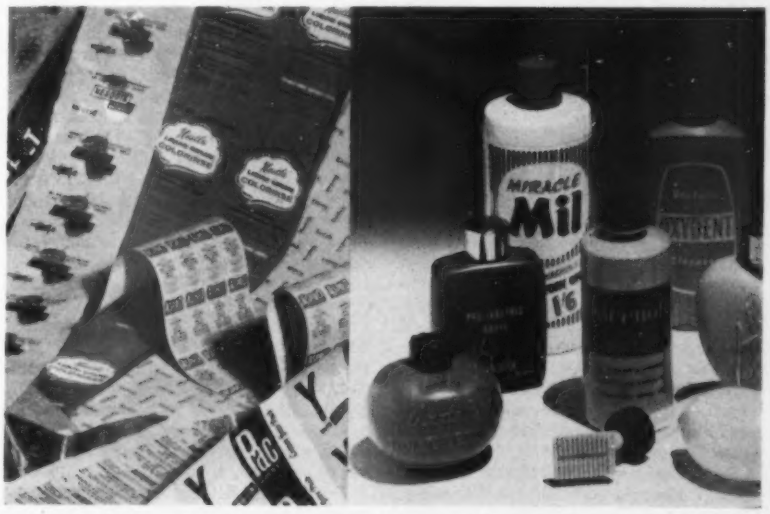
(*Continued from page 365*)

1 oz. and 28 lb. Also shown was a new automatic vibrator weigher suitable for handling irregular shaped objects as well as powders and granules. This machine has a weight range from ½ oz. to 1 lb. A rotary checkweigher, shown for the first time, operated at speeds of 55-60 per min. It is said to be suitable for check-weighing tubes, phials, etc.

Tableting equipment

Manesty Machines Ltd. showed a wide range of equipment. Machines not previously exhibited included the *Rotapress*, a new high-speed rotary tablet machine said to be capable of producing 6,000 tablets per min. A number of new features have been incorporated and include what is said to be an entirely new type of rotary feed, allowing almost dustless operation, and internal helical gearing, not previously used on tablet machines. A new form of pressure loading and overload release has also been devised.

The *DryCota* combined tablet making and compression coating machine was shown with the *CenterCota*, a unit developed for feeding round pre-made cores into the *DryCota*. Another model shown for the first time was the 300 stainless steel mixer.



Left: **Printed laminated pockets in reel form made by the Plastics Groups of the Metal Box Co.** *Right:* **Poly-Tainer blow moulded polythene bottles for detergents, cosmetics etc. These were all shown at the Packaging Exhibition.**

Packaging Exhibition Review

A Selection of Plant, Processes and Materials shown at Olympia, September 8-18

CONTAINERS

Phials and bottles

The Anchor Glass Co. Ltd. exhibited a range of phials of all types in natural and soda glass, both clear and amber, in various shapes. Serum phials sealed with rubber bungs and with aluminium seals, as well as with an aluminium seal fitted with a rubber disc, were also displayed. Other phials shown had neck fittings to take polythene closures and screw caps, and the newer snap-plug closure which has an inner plug fitting which permits the phial with which it is used to hold solids, liquids or powders.

The Cascelloid Division of the British Xylonite Co. Ltd. exhibited a wide range of containers in plastic. These included blown bottles from 3 c.c. to 10 gal. capacity, armoured polythene drums and *Tuboplast* polythene collapsible tubes. The company also supplies high and low density polythene bags, cellulose acetate containers and vacuum formed thermoplastic containers and bubble packs.

Holcon plastic bottles were featured by E. R. Holloway Sales Ltd. These are available in a wide variety of shapes and sizes and can also be designed to customers' requirements. A range of puffer caps and plugs, spray plugs, applicator nozzles and spray heads with captive caps was also on view.

The exhibit of Key Glassworks Ltd. was in the form of a "Self-service" display and covered a wide selection of detergent, medical, toilet and perfumery products packed in their glass bottles and jars.

Aerosols

The Metal Box Co. Ltd. featured a selection of the varied containers which they make for packaging. This included *Quikseal* and *Gardex* aluminium closures for vacuum packing in glass containers, aerosols of improved appearance with precision valves and with nitrogen valves for nitrogen propelled toothpastes. *Poly-Tainers* and other plastic moulding in some of the newer thermoplastic materials, such as high density polythene and polypropylene, were also on view, together with *Polytubes*, which are used for packing a number of pharmaceutical products.

The three companies in the Midland Aerosol Group exhibited the following. London Aluminium (Containers) Ltd.: A full range of aluminium aerosol cans from ½ to 20 fl. oz. capacity including for the first time a range of seamless one-piece aerosol cans; printed screw cap containers; and condenser cans. Speciality Valves Ltd. showed a range of aerosol valves including standard press-down valves, quick gassing tilt-action valves, glass aerosol valves, metering and foam valves, together with actuators, including standard liquid spray, fan mist, mechanical breakup, foam heads and other special actuators. A display of the different types of aerosol products packed in aluminium, tinplate and glass containers was featured by Midland Aerosols Ltd.

Seamless, transparent cellulose acetate tubes made by Formica Ltd. The tops and bases can be coloured.

Plastic containers

Plastic Packaging Ltd., a member of the Mono Containers Group, exhibited a variety of plastic containers. They also showed a range of plastic lids which are being developed for the existing waxed paper containers made by Mono Containers Ltd. These are available in several colours.

Formica Ltd. displayed for the first time their 4-*D* transparent containers made of clear, seamless cellulose acetate tube, in a wide variety of shapes, and in diameters up to 2 in. and lengths up to 7 in.; tops and bases are coloured.

A standard range of *Bubblepaks* was shown for the first time by the Plastic Packaging Division of Gordon and Goteh Ltd. Round, square and rectangular bubbles, previously made to measure only, were exhibited in stock sizes at prices reduced by up to 33⅓%.

Exhibits featured by Spesco Developments Ltd. included a full range of polythene bags printed in up to four colours and plain, case liners, sack liners and cut shapes. The company offers a complete range of sizes in both sheet and tubular polythene film.

Vitherm containers, drum liners, p.v.c. sacks and sachets were featured on the stand of Plastic Weldings Ltd. The containers, suitable for the transport of liquids and pastes have capacities of up to 45 gal., are made of p.v.c. and are available with a number of different closures. The drum liners, in capacities up to 45 gal., are circular. Also shown were *Mer-Vi* fibreboard drums with *Vitherm* liners for carriage of liquids, and collapsible tubes in clear and opaque p.v.c. with capacities from 4 to 16 oz.

Collapsible tubes

H. G. Sanders and Sons Ltd. displayed a variety of collapsible tubes designed for the pharmaceutical and allied industries. Each showed various internal lacquering and nozzle designs available to suit different products.

The John Dale Group displayed a full sample range of collapsible tubes in aluminium, tin, lead, and tin coated lead; rigid aluminium containers, and aerosol and pressure pack containers in one and two piece construction. Metal boxes in tinplate and aluminium were also featured, together with examples of sheet metal lithographic printing. A variety of plastic extrusion and compression mouldings was also shown.

The display of Betts and Co. Ltd. included metal collapsible tubes in a wide range of sizes and metals, with the latest type of cap shapes, dispensers and finishes, including the Bickle sleeve. Extruded aluminium containers, including pressure packs, were also shown together with plastic tubes in p.v.c.

Drums

Exhibits of John Feaver Ltd. included heavy gauge taper drums with *Prodoglass* treatment, decorated tinplate drums and a new style stackable keg.

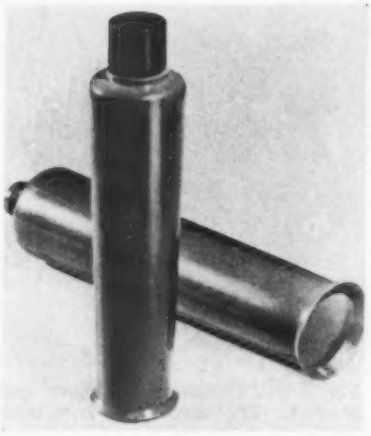
Polprotek drums were a feature of the display of Todd Bros. (St. Helens and Widnes) Ltd. These consist of a mild steel drum with a special top and latch type closing band, fitted with a polythene internal bottle. The bottle has a 2½ in. screw cap and polythene lock nut to hold it in place in the drum.

A 5 gal. square drum, stated to be of completely new design, was shown by E. A. Brough and Co. Ltd. This container is offered with a variety of closures and has been designed for economy of stacking. It is stated that the drums stack and nest with complete safety and will achieve a saving of approximately 20% storage space over the conventional cylindrical package.

Packing cases

Thames Board Mills Ltd. showed examples of *Fiberite* packing cases both for home and export trade. These cases are made in solid or corrugated board to suit the goods they carry. The selection on view ranged from simple constructions suitable for medical products, etc., to those for more elaborate manufactured goods needing internal fittings because of their fragile nature or for other special reasons.

Reed Corrugated Cases Ltd. are suppliers to Iridon Ltd. of a die-cut one-piece corrugated fibreboard case as an outer for their *Cubitainer*, the inner component of which is a semi-rigid polythene container. The latter is produced for carrying a wide range of liquids, powders and semi-solids.



Bottles with reinforced base from Lacrinoid Ltd.

The cases are die-cut to provide a perforated quick-opening release. This enables the spout of the polythene container, which is heat-sealed after filling and folded into the case, to be pulled out and cut open for pouring. The 5 gal. size has hand-grips for easy handling and pouring. The British Transport Commission have in principle approved the design and quality of the Reedac outer supplied to Iridon's specification.

Cubitainers are available in 1 gal. and 5 gal. sizes. A 1 qt. size will be available shortly.

MATERIALS

Tapes, foils, etc.

A range of *Lasso* pressure sensitive tapes and sealing machines was displayed on the stand of Smith and Nephew Ltd. Exhibits included *Lasso No. 76*, a pliable, waterproof tape said to be particularly suitable for automatic application, and a number of sealing machines and hand-operated dispensers.

The exhibit of Samuel Jones and Co. Ltd. placed particular emphasis on the company's labelling and sealing consultative service, which covers the complete labelling field, including the use of non-curling gummed papers, use of the correct grades of adhesive, pressure sensitive and thermoplastic labelling, etc. Also shown was the full range of *Gumstrip* and *Balestrip* tapes, and a new electric *Tapeshooter* with remote control, which may be preset for two lengths.

Robinson and Sons Ltd. showed a sleeve carton for dispensing tablet bottles. The carton is perforated in sections to the width of the tablet bottle and has a surface available for advertising matter stretching across the full face of the carton sleeve. On the reverse side copy can be printed on individually perforated sections of the carton, which can be broken off the sleeve in unit packs for dispensing by chemists, etc. Vacuum-formed cellulose acetate trays with transparent lids were also shown for the presentation of a tablet of soap and five bath cubes, a design which won the 1959 Packaging Design Contest.

The latest "under-surface" printed tapes and the full range of filmic, cloth and paper self-adhesive tapes, together with *Tickotabs* self-adhesive labels in paper, acetate, p.v.c., and foil, were displayed on the stand of John Gosheron and Co. Ltd.

A wide range of foils to different specifications was on show at the stand of Fisher's Foils Ltd. Emphasis was on retail packs, especially those made automatically on wrapping machines. Heat-sealable foil for the pharmaceutical industry was also shown, including foils coated with heat-seal lacquers for strip packing tablets, and a new strip-packing foil consisting of aluminium foil with a polythene extrusion, designed to give good protection.

Sections were also devoted to various laminates for the cosmetics and perfumes industries, and samples available included mould-inhibited aluminium foil soap wrappers, paper lined foils and foil lined folding boxboard.

The Commercial Plastics Group of companies showed their range of thermoplastic films and sheeting. These include p.v.c. film and sheeting conforming to many specifications and requirements, polythene tubular film and sheeting of varying densities and gauges, polypropylene film and sheeting, and high impact polystyrene and other thermoplastic materials for vacuum forming.

One of the main features was the demonstration of the use of *Craypak p.v.c.* film as a skin package. This clear, non-toxic material is vacuum formed over the articles to be protected, so that they are pilferproof, dustproof and yet visible during transport, storage and display. In most cases the articles are laid on a specially coated board, but fragile articles such as laboratory glassware can be skin packed on to polyurethane foam which acts as a protective cushion.

The ease of handling of *Fablothene* polythene film on packaging machinery was demonstrated, together with its use for automatic bag making and overwrapping applications.

The companies in the group who participated in the Exhibition were Anglo-American Plastics Ltd., Greenwich Plastics Ltd. and Iridon Ltd., all of whom provide a technical and advisory service regarding the use of thermoplastic materials.

British Celanese Ltd. exhibited the wide and increasing range of plastic materials which they produce for the packaging industry. Most important of these is cellulose acetate in sheet and film form, sold under the tradenames *Cellastine*, *Clarifoil* and *Celawrap*. Uses include vacuum-formed blister packs, laminated packs and sachets, rigid boxes, window cartons, tubular packs and food-wrapping. *Celatron* high impact styrene sheet was also shown as vacuum-formed box liners, pack bases, containers, etc.

The Telegraph Construction and Maintenance Co.'s stand gave prominence to *Telcothene* coated papers, boards, foils and textiles, and laminates. Special emphasis was given to the value of *Telcothene*, which is polythene processed by Telcon, as a moisture-proof and chemically resistant barrier. As a coating on paper, the product is said to act as a convenient heat-sealing medium, and to protect the paper surface against scuffing.

Applications for *Telcothene* coated

and laminated products were demonstrated. These included multi-wall sacks, incorporating coated Kraft, to contain fertilisers, plastic moulding powders and powdered chemicals generally, drums and other containers fabricated from coated boards, including corrugated cartons, and a variety of bags, sachets and other small containers made from coated papers of lighter substance for the packaging of chemicals and other commodities subject to contamination.

The B.B. Chemical Co. Ltd. demonstrated a new system of thermoplastic melt adhesives, the adhesives being in the form of coiled rod fed into special thermostatically controlled applicators and melted as required. The system is said to have many advantages over conventional heated gluepots and rapid bonding is possible. No drying time is required, so that the bonding of difficult impervious materials, *i.e.* polythene and polythene coated materials, moisture resistant films, etc., is easily accomplished.

Adhesive can be melted and applied by extrusion nozzles or transfer wheel applicators. Devices are also available which will print transverse lines or patterns for " bottoming " operations, etc.

Spicers Ltd. gave pride of place on their stand to examples of packs incorporating *Netlon* or *Carbion*. *Netlon* is a net-like tubular material made of plastic filaments fused together during manufacture, so that it is neither woven nor knotted. Now available in a wide range of colours, materials, patterns, filament thicknesses, mesh sizes and diameters, it can be adapted to many packaging purposes. Examples of *Carbion* in use were also shown. In its flexible form this material is "elasticised," is load resistant, cushioning and resilient, while the "rigid" (non-stretching) form is suitable for shock absorbing and interleaving purposes (see MANUFACTURING CHEMIST, July 1959, p. 300).

The full range of *Scotch* brand pressure sensitive tapes was displayed on the stand of the Minnesota Mining and Manufacturing Co.

The Viscose Development Co. featured viscose seals under the brand names *Viskaps* and *Viskrings*. These shrink to fit the bottle neck, sealing the primary closure. Recent developments in printing technique enable *Viskrings* to be printed in up to four different colours and to reproduce intricate trade mark designs. To keep the main portion of the seal intact and to facilitate the removal of the stopper or closure, perforated *Viskrings* have been introduced, so that a strip about ¼ in. wide can be peeled off the top of the seal, leaving the bulk of the seal intact complete with advertising matter, etc. Plastic headed bottle stoppers were also on view. In these,

The 5 gal. Cubitainer for liquids and powders. The double-wall corrugated fibreboard outer supplied by Reed Corrugated Cases Ltd. is die-cut for quick release of the spout of the polythene inner container. Perforated hand-grips are die-cut in the sides for handling while pouring.

the head, made of polystyrene, is guaranteed impervious to water and spirits. They are said to be applicable on bottled chemical products.

Boards and papers

J. H. Sankey and Son Ltd. exhibited their range of *Sisalkraft* and *Fibreen* reinforced waterproof packaging papers, *Sisal Tape* reinforced hinge, stay and strapping tapes and reinforced waterproof papers to Government specification. The range included *Sisalation*, a combined thermal insulating material and moisture vapour barrier, copper armoured *Sisalkraft* for external weathering of cases likely to be exposed for long periods, and *Moistop*, a polythene coated reinforced waterproof material. *Seekure*, a resin bonded, non-staining, glass reinforced waterproof paper, was introduced at the exhibition.

The exhibits on the stand of Thames Board Mills Ltd. included displays of the various packaging boards known under the generic name of *Thames Board*. These included white duplex pulp board, white lined manilla board, lined and unlined chipboard, and British strawboards. The possibilities which these boards offer for carton and box making were illustrated by actual packs. Of particular interest to box makers and packers are the printing and making-up qualities of these boards.

A *Keb* moulded wood wool pack designed for chemical and pharmaceutical use was shown on the stand of Evans Bellhouse Ltd. It is stated that the moulding, which is usually combined with a suitable carton, can be adapted for most sizes and shapes of bottle.

The British Standards Institution stand incorporated a selection from some of the 90-odd standards relating to packaging and containers. They ranged from the comprehensive packaging code to " test " specifications for materials such as glues and vegetable adhesives; and from standards for films, foils, etc., to those for paper boxes for pills, tablets and kindred items.

MACHINERY

Packaging and labelling

The stand of Baker Perkins Ltd., Baker Perkins (Exports) Ltd. and the Forgrove Machinery Co. Ltd. was adjacent to the stand of Höfliger and Karg, of Stuttgart, whose packaging machinery is sold by Baker Perkins and Forgrove in the United Kingdom. Equipment from Package Machinery Co. and R. A. Jones and Co. Inc., both American firms, was also exhibited. Exhibits on the Baker Perkins stand included the Forgrove *Model* 84 *Flowpack* with which, it is claimed, any article which can be carried inside a tube of wrapping material by belts gripping the sides, or top and bottom (providing the product is sufficiently rigid to be pushed by a chain lug), can be wrapped. It is a continuous motion wrapping machine and will handle products up to approximately 200 mm. long, 90 mm. wide and 63 mm. high. The manufacturers state that because there are no reciprocating movements on the machine it is possible to run at speeds of up to 180 wraps per min. Photoelectric cell registration gear can be fitted to centralise any printed matter on the wrapping material.

Höfliger and Karg showed an *LFS* machine for filling and closing all types of vials for the chemical, pharmaceutical and cosmetic industries. It is stated that all types of liquids, oily or watery, can be handled. Vials leave the machine on a conveyor band and pass to a *CAR 3a* cartoning machine, which was also on view. It is designed to take from the flat a pre-glued, open-ended carton, form it, load and close, and has a capacity of 60-80 packages per min.

The exhibit of John Gosheron and Co. Ltd. emphasised the importance of machinery in modern packaging. The full range of Gosheron dispensers was demonstrated, one of the *Three Musketeers* carton taping machines, an automatic tin sealing unit, a hand carton sealer, a shallow "U" sealer and a four-colour tape printing machine.

The exhibition coincided with the company's fiftieth year in the packaging tapes industry.

The stand of Wm. Gardner and Sons (Gloucester) Ltd. featured a can labelling machine, laboratory size horizontal and double cone mixers and a sifter-mixer.

The *Sticla* adhesive sealing machine was featured on the stand of the Thames Sack and Bag Co. Ltd. It is stated that the machine can be used

with polythene and cellulose film bags and multiwall paper sacks of any width, and heights up to a maximum of 40 in. when filled. An optional feature is an easy-to-open device in the form of a concealed nylon cord which runs the length of the seal.

A range of *Newman* labelling machinery exhibited by D. Trapow and Co. Ltd. included two new models, the 24A, a bench type labeller which will apply labels 7 in. by 5¼ in. at a height of up to 6¼ in. from the container base, and the 4B, an automatic machine fed by gravity ramp, in which the containers are fed straight through the gum plate. The labeller will accept containers up to 2¼ in. dia. and the maximum label size is 3½ in. by 7 in. wide. A self-feeding gumming machine was also shown. This was the model 1*D*, with label size limits from 1 in. by 1½ in. to 6 in. by 6 in. on the standard model, and 6 in. by 12 in. on the extended model. A new feature of the machine is a lid attachment which allows labels to be hand fed. Among other equipment on view was a vial and ampoule printer, the model 1*F*. It incorporates a double impression offset system and can be used with either air drying or ceramic inks. According to the manufacturers any small cylindrical object between ⅜ in. and 1⅜ in. dia. can be printed, whether of glass, plastic, metal, etc. Output is 70-100 per min. and a universal feed hopper and a 4 ft. conveyor stretch are standard equipment.

A large proportion of the Minnesota Mining and Manufacturing Co.'s exhibit was devoted to the activities of their Tape Customer Engineering Service. A range of manual, semi-automatic and automatic tape dispensing equipment was on display.

Spesco Developments Ltd. demonstrated the semi-automatic *Kisss* heat sealing machine. This has been developed for the quick sealing of polythene bags up to 12 in. wide.

Part of the exhibit of the A.B.C. Polythene Co. was devoted to four machines from the Doughboy range of heat sealing equipment for which the company is the sole U.K. agent. The machines were the *Model HS-C*, a band sealer for polythene and plastic films; the *Model HS-B*, a similar machine for cellulose film, laminates, *etc.*; the Model *CBS-CH*, a new machine especially designed for sealing 1,000 gauge polythene sacks and sheets at high speeds; and the *Model PJS*, an automatic machine for sealing and attaching header labels to cellulose and plastic bags.

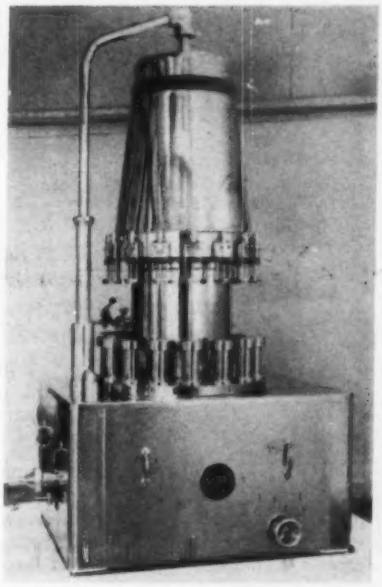
Printing machinery

Anglo-Continental Machines Ltd. exhibited machines by Kilian and Co., Joseph Uhlmann and Hapa A.G. These included an automatic printing machine made by Hapa A.G. for overprinting labels, collapsible cartons and the inside of tin lids, as well as cellophane and plastic bags; the Uhlmann *Type HAS* 111 strip packaging machine for packing tablets, suppositories, dragees, etc.; and the Kilian two-layer *Prescoter* which has two hoppers and a special fill shoe. It will produce normal tablets as well as press-coated and two-layer tablets.

Two new printing machines were shown by Edlon Machinery Ltd. Of these the Kamman *Model K*.10 is a general purpose silk screen machine for multi-colour register printing on flat and cylindrical containers in most materials. It has a compressed air unit for thin-walled flexible containers or tubes. The other machine, the *Gallus* 0.12, is a small label printer with cross-cut and pile delivery box. Maximum label size is 4 in. by 2¼ in. and average speed approx. 8,000 impressions per hr.

Filling machinery

Filling and capping machines displayed by Albro Fillers and Engineering Co. Ltd. included small single-head bench type hand-operated fillers, semi-automatic types and fully automatic high-speed models, working on the vacuum principle for thick or thin liquids. One unit, the *Albro* 15-head vacuum operated dustless powder. filling machine, has a speed range up to 150 per min. when handling 2 oz. and 4 oz. cans. The *Albro T.C.* volumetric filler for containers up to 1 gal. is a new filler working on a time control principle. It is claimed to deposit accurate quantities irrespective of the weight, shape or size of the container and can therefore handle plastic bags, etc.



Albro C.T. 15 type low vacuum operated filling machine. Output on 26 oz. bottles is up to 4,300 per hr.

Roberts' Patent Filling Machine Co. Ltd. exhibited various types of filling machinery. These included the *Advance* drum filling machine which handles containers from 1 to 10 gal., filling them to correct gross weight. Automatic dial scale filling machines were also shown, designed to give a correct net weight. These are said to be suitable for filling almost any liquids into drums, the machine automatically compensating for the tare of the drum. It is suitable for installations which do not require flameproof electrical fittings. Another machine on view had been designed for operation in Group II petroleum or acetone vapours and had a specially designed pressure type filling valve, antihydrostatic provision and submerged filling. Operation is pneumatic and automatically intersequenced. The Roberts patent four-head *Straightline* bottle filling machine was also exhibited.

Southall and Smith Ltd. exhibited a comprehensive range of weighing machines, including several models which were shown for the first time. Four machines on view were representative of the range manufactured. These were the *Model D*11 automatic weighing machine, suitable for free flow materials, and said to be capable of weighing speeds of up to 30 per min. with consistent accuracy. Models are available with capacities from 1 oz. to 2 lb. The *Model SP*10 automatic weighing machine, suitable for powders such as chemicals and fertilisers, is capable of weighing speeds up to 17 per min. with capacities between

(*Continued on page 361*)

Vacuum-formed cellulose acetate tray and transparent lid displays for soap tablet and bath salt cubes, by Robinson and Sons Ltd.

Perfumes for Cosmetics

5. BATH PREPARATIONS

By V. Vasic, CH.E.

In this review Mr. Vasic discusses perfumes for bath salts, bath oils and essences, bath capsules, bubble baths and bath powders. Several formulæ are given to supplement his practical hints on the successful manufacture of bath preparations, the perfuming of which is of first importance. His previous four articles dealt with perfumes for face powders (July 1958), face creams (August), lipsticks (October) and deodorants and anti-perspirants (June 1959). Suntan preparations will be covered in a further article.

MODERN bath preparations may be divided into five distinct categories: bath salts, bath oils, bath essences, bubble baths and bath powders. Bath preparations are usually formulated for several or all of the following purposes: to provide a distinctive pleasant aroma to the bath water; to enhance the feeling of well-being by the refreshing fragrance; to clean the body by removing dirt and odour and to add a pleasing fragrance to the body; to help soften hard water; and to prevent a ring from forming around the bath tub. The perfume of a bath preparation is all-important because the attractive scenting of the bath water is both æsthetic and hygienic, making a bath a real pleasure.

Type of perfume

Perfume for bath preparations must be strong in odour and readily volatile in the warm water. The fragrance of pine scents, such as pine needle oil, dwarf pine oil, silver fir oil, spruce needle oil, etc., is ideal for bath preparations. Eau-de-cologne and lavender, together with their heavier modifications and fougère type of perfumes, run close in popularity to the pine perfumes. Jasmin, gardenia, rose and lilac are also used and many bouquet odours give good results.

Heavy fancy compositions or sweet floral perfumes are unsuitable for bath preparations.

BATH SALTS

Bath salts, the most popular bath preparations, are of two main types: *a*. those that are primarily intended to perfume and colour the bath, and *b*. those that in addition help soften hard water.

Type *a* bath salts usually consist of coloured and perfumed rock salt crystals. Epsom salt or Glauber's salt may also be used. Other neutral salts could be employed, but they are usually too expensive.

Type *b* bath salts are usually based on one of the sodium phosphates or on sodium sesquicarbonate. The most common for this purpose is trisodium phosphate, but it is seldom used alone in bath salts, because of its high alkalinity. Sodium sesquicarbonate or borax, or both, are usually mixed with the trisodium phosphate to buffer its high alkalinity.

Because of inert character of rock salt crystals bath salts of type *a* may be perfumed with any perfume and coloured with any of the certified colours.

Perfumes for type *b* must withstand the alkaline reaction without changing with age. The colour, too, must be alkali-resistant.

Perfume compounds

In developing the perfume for bath salts particular attention should be given to possible reaction between its ingredients and the basic salt mixture. The perfume-colour combination must be of such a nature that it will not be reactive and therefore not cause changes in colour or odour. This is not a problem involving conditions of use so much as of shelf storage, which is usually from six months to one year.

Many perfume compounds are unsuitable for making a perfume for bath crystals because they deteriorate quickly in contact with the alkaline crystals. In general, perfume compounds designed for use in soaps are satisfactory in bath salts, although these are frequently more strongly alkaline than most toilet soaps. Certain otherwise very stable and useful perfume compounds and essential oils are excluded. Often changes may not be apparent when the bath salt is freshly prepared, as the faulty reaction will only make its appearance upon storage, and even then may depend upon varying climatic conditions, therefore exhaustive shelf-life tests should be carried out before any perfume is adopted.

Conifer oils are especially important in the compounding of bath salt perfumes. Petitgrain oil, citrus oil, sage oil and verbena oil are useful modifiers, whilst bornyl acetate intensifies the natural odour of conifer oils and eucalyptus oil makes it appear fresher. The use of a substantial amount of resinoid fixatives, such as resinoids of olibanum, galbanum and of elemi, are of great assistance in improving the lasting qualities of a bath salt perfume.

Among synthetic perfumery materials, those with a highly diffusive power should be chosen, because of the necessity to volatilise in moist air. Bornyl compounds, benzyl acetate, phenyl ethyl alcohol, aubepine and traces of fatty aldehydes and fatty alcohols are most useful for this purpose.

Colouring

Bath salts perfumed with pine odour are usually given a green fluorescent colour. With jasmin and gardenia perfumes, yellow or orange colours are generally used; with rose, lilac and lavender perfumes, pink to purple colours are customary.

Concentration of perfume

The recommended concentration of perfume ranges from 0·5 to 5%; 0·5 to 1% of perfume is the usual quantity used.

Incorporation of perfume

The perfuming of bath salts is simple. The crystals are placed in a ribbon powder mixer, and a solution of the perfume, alcohol and the desired colour is added to the crystals with mixing. After the crystals are uniformly coloured, they are placed on trays to allow the alcohol to evaporate, and are then ready to be packed.

When insoluble colours are used, the perfume and the colours are ground with diethylene glycol ethyl ether and sprayed on to the crystals, which are then thoroughly mixed until colour and perfume are homogeneously distributed.

The following formulæ of perfumes are suitable for both types of bath salts.

Pine Perfumes for Bath Salts

1

Bornyl acetate	40·0
Terpineol	26·7
Pine needle oil, Siberian	22·3
Eucalyptol	6·7
Coumarin	3·3
Citral	1·0
	100·0

2

Pine needle oil, Siberian	70·0
Spike lavender oil	12·0
Terpineol	10·0
Cedar-wood oil	5·0
Eucalyptus oil	3·0
	100·0

Pine Perfume A.P.2 for Bath Salts

Pine No. 420, Givaudan	35·0
Bornyl acetate, cryst	20·0
Lavender oil	15·0
Pine needle oil, Siberian	10·0
Bergamot oil	10·0
Menthol, natural	5·0
Lemon oil	5·0
	100·0

Fougere type Perfume A.P.1 for Bath Salts

Fougere 1285, Givaudan	30·0
Lavender oil	20·0
Bergamot oil	10·0
Linalyl acetate ex Bois de Rose	10·0
Geraniol	10·0
Raldeine delta	5·0
Lemon oil	5·0
Menthol, natural	5·0
Coumarin	2·0
Geranium oil, Bourbon	2·0
Versalide	1·0
	100·0

Eau-de-Cologne type Perfume for Bath Salts

Bergamot oil	26·0
Orange oil, sweet	26·0
Petitgrain oil, Paraguay	26·0
Thyme oil, red	6·5
Citral	5·5
Rosemary oil, Spanish	3·5
Beta-Naphthyl methyl ether	6·5
	100·0

BATH OILS AND BATH ESSENCES

Liquid bath perfuming preparations can be considered a part of perfumery rather than cosmetics, for the main purpose of the product is to make a pleasant odour. Liquid bath perfuming preparations are of two main types: bath oils—an oily type not miscible or emulsifiable with water, so that the perfume oils are kept on the surface of the water; and bath essences — preparations soluble or emulsifiable in water.

The advantage of the bath oils lies in the fact that the odour is generally more concentrated on the surface of bath water and therefore better able to please the bather. By this means, little perfume need be used to achieve maximum odour effect, but unfortunately a very definite oily scum appears on the high-water line. The materials which will re-emulsify the film when soap is added to the bath water are included in bath oils in order to overcome this disadvantage.

Bath essences, which spread the odour throughout bath water, do not provide as strong an odour, but neither do they show a tendency to form a film on the tub or on the skin of the bather.

The perfume types recommended for bath salts are equally suitable for bath oils and bath essences. The amount of perfume is dependent upon the type of perfume, solubility of perfume in the base, solubilising effect of the solubilising agent and the price of finished product, so that the perfume content may be anything between 5 and 25%.

Bath oils

Bath oils are prepared by dissolving perfume in castor oil, with the viscosity adjusted by means of alcohol and the addition of an oil-soluble colour, if desired. Other oils can be used for this purpose, but they are more difficult to perfume and colour. Some of the synthetic oily esters may be used for such preparations, *e.g.*, isopropyl myristate, isopropyl butyrate and others. They can be easily perfumed and coloured. The amount of alcohol is controlled primarily by the viscosity adjustment.

Perfume for Bath Oil

Patchouli oil, Singapore	4
Geranium oil, Bourbon	10
Lavender oil, Mont-Blanc	10
Linalool ex Bois de Rose	14
Absolute Mousse Ambre 73, Bertram Fils	5
Bergamot oil, Reggio	9
Vetivert oil, Bourbon	7
Coumarin	13
Heliotropin	7
Musk ambrette	3
Musk xylol	2
Vetiveryl acetate	10
Methyl nonyl acetaldehyde, 10%	4
Ylang-ylang oil, II	2
	100

Bath essences

Bath essences are perfumes dissolved in solubilising agents. In addition to the perfume, they contain a detergent that will eliminate calcium salt deposits which, together with the fatty acids from soap, cause a ring around the bath. The composition of the essence should be compounded so that it disperses uniformly in the water without separation of free perfume.

Some bath essences produce clear solutions that go milky when poured into water, while others are so highly solubilised that they remain clear on dilution. This latter type is not a true molecular solution, but is actually a dispersion or emulsion of particles so finely divided (colloidal dimensions) that the product appears to be a solution. Originally sulphonated oils were mixed with the perfume for this purpose, but modern bath essences are based on the synthetic non-foaming detergents with a perfume-solubilising agent to keep the product clear. They are sometimes diluted with water to reduce the price.

For the production of such transparent pseudo-solutions the poly-oxyalkylene sorbitan esters are used —notably the monolaurate and mono-oleate—and certain of the polyoxyethylene ethers, based on alkyl phenols or castor oil. Many non-ionics are suggested as perfume-solubilisers: *Nonex* 39, *Nonex* 55, *Nonex* 99 (Gemec Chemical Co.), *Texofor* A1P, *Texofor* D40 (Glovers (Chemicals) Ltd.), *Tween* 20, *Tween* 60, *Tween* 80, *Atlas* G-2162, *Atlas* G-7596-P (Honeywill-Atlas Ltd.).

Solubilised Perfume Compound

Perfume compound	1
Tween 20	6
Water	93

Preparation: Dissolve perfume compound in *Tween* 20, and slowly add water at room temperature, with moderate agitation.

The concentration of perfume at 1% level is low and if concentrated perfume is required the water may be omitted and a solution, or rather dispersion, of very much greater strength of perfume prepared. The following formula illustrates the use of higher level of bath perfume and dispersant.

Perfume compound	15
Tween 20	85

Preparation: The perfume compound is mixed with the solubiliser at room temperature and the mixture can then be diluted with any proportion of water without clouding.

The amount of solubilising agent must be adjusted, as it depends upon the type of perfume used as well as on the solubilising effect of the solubilising agent.

For most perfume compounds three to five parts of solubiliser will solubilise one part of perfume compound in water, although with certain compounds as much as eight to nine parts of the solubiliser may be necessary to obtain a clear solution. In order to increase the solubility, co-solvents such as diethylene glycol monoethyl ether, ethyl alcohol and isopropyl alcohol are recommended. The non-ionic solubilising agents act as fixatives and often enhance and mellow the bouquet of the perfume compound.

Bath essences are easy to make. The sulphated oil or the detergent is placed in a tank. The perfume is combined with the solubilising agent. The mixture is added to the oil and stirred until uniform and the desired colour added with mixing.

Perfume A.P.3 for Bath Essence Fougere type

Fougere 1285, Givaudan	30
Bergamot oil	5
Lemon oil	5
Menthol, natural	5
Lavender oil	5
Diethylene glycol monoethyl ether, rectified	50
	100

Pine Perfume A.P.4 for Bath Essences

Pine 43, Givaudan	35
Menthol, natural	5
Bergamot oil	5
Lemon oil	5
Lavender oil	5
Diethylene glycol monoethyl ether, rectified	45
	100

Bath Essence

Pine needle perfume	5
Atlas G-7596 P	25
Sodium carboxymethylcellulose ...	1
Water	69
	100

Preparation: Disperse sodium carboxymethylcellulose in water. Mix perfume and *Atlas* G-7596 P, then add slowly with agitation sodium carboxymethylcellulose dispersion to the mixture of perfume and solubiliser.

BATH CAPSULES

The concentration of perfume in bath oils may be increased so that only a few drops of oil are needed to perfume the bath. Such concentrated bath oils may be packaged in soft gelatin capsules. Make quite sure that the perfume chosen does not attack gelatine.

BUBBLE BATHS

Bubble or foam baths are very popular. They are produced in the forms of crystals, powder, tablets, liquid, capsules and " soap " cakes.

Many different synthetic detergents which foam when water pressure is applied, and also powdered and liquid soaps, have been used for the formulation of bubble baths. The bubble baths of desired properties may contain also non-detergent surface-active agents, emulsifiers and sequestering agents. Natural and synthetic water-soluble gums are sometimes used in bubble bath formulas to impart properties not possessed by some detergents. These otherwise good foaming detergents will not keep dispersed soil from redepositing. Sodium carboxymethylcellulose has this property, and some bubble bath formulations contain small amounts of it to keep soil particles in suspension and to increase the viscosity to give the desired body to the liquid bubble bath.

Eau-de-Cologne type Perfume for Bubble Bath

Petitgrain oil Paraguay, terpeneless	29·0
Orange oil, sweet, West Indian ...	5·5
Beta-naphthyl ethyl ether	2·1
Methyl nonyl ketone	0·3
Citral	0·3
Acetophenone	0·3
Bergamot oil, Reggio	32·0
Lemon oil	24·5
Lavender oil	6·0
	100·0

BATH POWDERS

Bath powders are usually made with from 60 to 90% of talc. About 5% of magnesium carbonate is used to absorb the perfume and hold it in the finished product. The perfume is mixed with magnesium carbonate before being added to the rest of the ingredients. Many other ingredients are used in small amounts to give desired properties to the finished product. These are precipitated chalk, zinc oxide, kaolin, zinc stearate and titanium dioxide.

Bath powders need special perfumes to cover up the earthy odour of the ingredients. Small amounts of the synthetic musk-like fixatives are very useful for this purpose.

Effect of talcum

Bath powders containing a high amount of talcum almost invariably change the odour of the perfume compared with the type of smell that would be produced in alcohol. It is especially noticeable in the case of floral compositions and fancy bouquets, otherwise the same observations as mentioned in the face powder perfumes are applied in the compounding of perfumes for bath powders.

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DISINFECTANTS and Disinfection

By A. H. Walters, F.I.M.L.T., M.R.S.H., M.I.BIOL.

Skin disinfection • Inhibition of ophiobolus and aspergillus
Germicidal zinc • Reactivating Esch. coli • Bactericidal bloodwood
Reducing spore heat resistance • Inactivating flu virus

Skin disinfection

HILAIRE Belloc once referred to the "social curse becoming hoarier and hoarier," and any reviewer of papers on disinfection could possibly apply the same thought to skin disinfection which has once again appeared as the subject of a review,[1] this time in a medical paper. The hoary old-timer about various disinfectants being ineffective against various spores in the skin appears once again, but no mention is made of the various sets of circumstances under which the hands of doctors and nurses become infected with pathogenic spores which resist removal by ordinary scrubbing with soap and water.

Mention is made of a technique involving small biopsies of skin prepared with antiseptics by which it has been found that 0·5% alcoholic acrizine is as good as 2% iodine in alcohol or 0·5% alcoholic or aqueous chlorhexidine. Iodophon, Q.A.C.'s and hexachlorophene in various guises are mentioned. The author very generously observes that the factors which determine sepsis are numerous and it is not surprising that published data on the protective rôle of skin disinfectants are inconclusive.

Two main points seem to arise. First, under what conditions in hospital practice is it essential to wash the surface of hand skin completely free of all micro-organisms, and for how long must the skin stay like that and why? Second, if there is a resident bacterial flora in skin at an operation site, should not an attempt pre-operatively be made to ascertain whether this is potentially pathogenic or not? If there are potential pathogens present, then suitable systemic therapy perhaps needs to be given before the operation to ensure safety; if not, then washing with soap and water and drying off with alcohol would seem sufficient. Any consideration of skin disinfection must surely involve a careful study first of the precise conditions of where, when and for how long it is required.

Inhibition of ophiobolus and aspergillus

The fungus *O. graminis* infects the roots of wheat and barley but not oats, while the variety *avenæ* subjects all three cereals. Growth of *O. graminis* is stimulated by cysteine, but var. *avenæ* is inhibited. Growth of *Asp. niger* is also inhibited by both cystine and cysteine, *Pen. notatum* is susceptible to inhibition of respiration by cystine. Some preliminary information about this inhibition of *O. graminis* var. *avenæ* and *Asp. niger* (which behave identically), obtained during an attempt to correlate specificity of parasitism with metabolic differences, is now reported.[2]

With both fungi, substitution of 0·5% ammonium nitrate by 0·5% ammonium sulphate prevents inhibition, and when sodium molybdate is added to ammonium nitrate medium a similar phenomenon occurs. As a result of these and other experiments the author concludes that the type of inhibition indicated is a metal chelation effect connected with an early stage of nitrogen metabolism. The reversal of inhibition by molybdate suggests an effect on enzymes of the nitrate reducing sequence, but this as yet is not proven by the respiration experiments.

Antibacterial zinc in maple sap

An interesting observation has been made in the U.S. on the inhibition of organisms in maple sap when placed in galvanised 10 gal. cans. In new cans, infected syrup gradually became sterile, but in older cans microbial growth proceeded at the usual rate. The germicidal effect was attributed tentatively to zinc coatings.[3]

The oligodynamic effect of metals has long been known and inhibition of growth by zinc was reported in 1923. As has been found with many inorganic inhibitors, small concentrations of zinc can be stimulatory to growth. The study now reported was initiated to discover if zinc ions from surfaces of galvanised iron containers when in contact with maple sap would inhibit bacterial growth in that medium.

Cans of frozen maple sap were thawed and distributed into glass and various galvanised (used and new) containers in 5 and 10 gal. lots. These were inoculated with mixed strains of *Bacterium* 587, *Pseudomous*—11 and 25, *Flavobacterium* 583, yeast M 6, and *Cryptococcus albidus*—496. The inoculated samples were held at 0·5° to 2·5°C. and examined at various intervals up to 20 days. Total counts were estimated by plating on TGY agar.

Results showed that new galvanised tins having a rough surface caused an immediate decline in the number of viable micro-organisms and that in 20 days they were practically extinct, while in old tins cleaned with an alkaline detergent or in glass containers the inocula proliferated normally. If a used galvanised container was washed in 6% sulphamic acid it was found that this treatment restored the zinc ion-yielding surface and inhibition resulted. As a side issue the toxic effect of several zinc salts was tested in maple sap and in all cases antibacterial action was observed. Polarographic estimations showed that 5 p.p.m. zinc will

inhibit multiplication of micro-organisms inoculated into sap.

Several years ago one maple processor employed new, large galvanised collection cans to avoid the necessity of frequently emptying smaller collection buckets. The sap, therefore, was held unprocessed for a period of up to 1-2 weeks, contrary to good maple sap handling practices which ensure processing within one day of collection from the tree. It was expected that the long holding time would yield low-grade syrup with a high bacterial count, but due to the shedding of ionised zinc from the large container this was not the case. Clear evidence of inadvertent disinfection!

Reactivation of chlorine-inactivated coli

The problem of resuscitating bacterial cells which have been exposed to antibacterial substances or processes has been studied by many workers. Those who have made observations on the action of chlorine in particular appear to have evolved some peculiar terms such as: "These investigators were able to 'reactivate' chlorine-killed bacteria provided some survivors remained after treatment with chlorine." Presumably what is meant by this jargon is that cells which survived a certain exposure to hypochlorite could recover and be brought back to active proliferation. Some work has now been reported[4] on the rôle of various culture media in repromoting proliferation. Five media were used:

1. A normal nutrient agar.
2. A "minimal" agar K_2HPO_4 7 g., KH_2PO_4 3 g., Na_3 citrate 0·5 g., $MgSO_4$ 0·1 g., $(NH_4)_2SO_4$ 1 g., Bacto agar 20 g., distilled water 1,000 ml. Glucose was sterilised separately and added aseptically to the medium to contain finally 0·2%.
3. Minimal agar + 1% peptone.
4. Minimal agar + 0·3% Bovril.
5. Minimal agar + 2% yeast extract.

The test organism was *Esch. coli*, an inoculum of which was prepared by washing cells three times and then diluting them to give a "barely visible suspension." This suspension was further diluted five-fold in liquid medium, *p*H 7·0, to contain about 2 to 5×10^7 cells. For the first experiments chlorine was added to give a concentration of 0·2 p.p.m. and at 1, 2 and 3 hr. intervals aliquots were removed and the excess of chlorine neutralised with 200 p.p.m. sodium thiosulphate. Various dilutions were plated on nutrient and on minimal agar. As would be expected, much higher survival counts were obtained on the richer medium, the survivor percentages being 20%, 2% and 0·1% on nutrient agar and 2·4%, 0·04% and 0·00008% on minimal medium. These two sets of figures give ratios of 8, 50 and 1,250 respectively, hence the authors observe that when plating was performed simultaneously on nutrient agar and minimal agar, up to 1,000 times more colonies developed on nutrient agar than on minimal agar. Later experiments on similar lines employed "large" amounts of available chlorine (1 p.p.m.) for 3 and 6 min., and, as expected, differences in % survival as enumerated on the two media were of the order of five-fold only.

This is an interesting piece of work somewhat marred by the use of unusual terms, as already mentioned. The greatest possible care must be exercised in quoting this paper, (*a*) because the phenomena described are generally applicable to most bacterial cell suspensions which have been exposed to any part - lethal - part - non - lethal treatment, and (*b*) because the infinitely small amounts of available chlorine used could be overlooked and results might be interpreted as demonstrating resistance to chlorine in practical applications.

Antibacterial bloodwood

The very obvious lack of knowledge in the history of disinfectants has been commented upon in these notes.[5] It is now refreshing to review a paper[6] which begins: "While doing field work (in 1942) in the Gulf of California and later on the mainland of Sonora, I found the people there using this plant (*Hæmatoxylin Braziletto*) for medicinal purposes. A sliver of wood dropped into a glass of water very quickly produces a pink solution strongly resembling permanganate of potash. The potion is then drunk as a remedy for 'whatever ails you.' I also found them placing the wood in the drinking troughs of their chickens and, in some districts, in the water of the rural schools. . . . My question is, then, have the natives employed a drug for medicinal purposes where we have remained unaware of such value and used it merely in micro-technics?"

The wood comes from the Brazilian bloodwood tree which grows in lower California and Mexico. The local name, Palo de Brazil, is derived from the word "braza," meaning "glowing like fire," and may be applied to a number of soluble pigment-bearing red woods. The red heartwood of *H. Brazilleto* contains a water - soluble substance, brazilin, which on mild alkaline oxidation or exposure to air yields red brazilien. In 1899 it had been reported that logwood is well adapted to the treatment of that relaxed condition of the bowels which is apt to succeed cholera infantum, but there was no direct reference to antibacterial action.

Tests were made first simulating the native use of *H. Braziletto*. Weighed amounts of wood chips were placed in 10 ml. quantities of water, allowed to soak, and subsequently tested against *S. typhosa* and *E. coli* and some degree of bacterial action, particularly against *S. typhosa*, was observed. Later tests using heartwood extract showed a greater sensitivity with *S. aureus*, and some slight anti-mycotic action. Subsequent chemical tests appeared to indicate that more chemico-biological assays of both brazilien and haematoxylin are needed to complete the study of these interesting dyes.

Your reviewers' thoughts went back to his grandmother's quinine bowl, a wooden bowl lined with cinchona bark, which she used to keep filled with rainwater. If any child had a "fever" he was dosed with the magic water from the quinine bowl.

Reduction of spore heat resistance

Heat processing of canned foods can be reduced if certain substances are added first to lower the heat resistance of contaminating spore forms. Hitherto the substances concerned have been principally nisin and subtilin. A massive survey of some 650 substances which were considered might reduce the heat resistance of bacterial spores has now been done.[7] Thermal death time (T.D.T.) tubes 9×120 mm., were filled with 2 ml. of Andersen's pork-pea broth containing the substance to be tested and inoculated with 6×10^5 spores of the *Clostridium* strain PA 3679. The tubes were sealed and then heated in an oil bath at 113°C. for 14 min. which

permitted about 5% of the spores in the controls to survive. The tubes were then cooled, opened, diluted and plated to count the surviving spores using Anderson's anaerobic plating technique. The medium *cum* test substance was diluted after heating at least to 1:1,000 when plated. At this dilution the concentration of added substance was usually too low to affect subsequent germination. Some of the primary solvents for some of the substances tested were also slightly suspect, but dilution on plating was considered to nullify any risk of significant carry-over.

Of some 650 substances tested, 26 showed some effect in rendering spores more vulnerable to heating. Such activity was frequently among substances known to be mutagenic for higher organisms and among organic sulphur compounds. It was infrequent among antimicrobial chemicals, antibiotics and substances taken at random. Among the more active substances were subtilin and its methyl esters, nisin, ethylene oxide, diepoxybutane, hydrogen peroxide, formaldehyde, dodecylguanidine-H Br, cetyltrimethyl ammonium bromide, nordihydroguairetic acid, 2-methyl-1,4-naphthoquinoline, and tetrachlorohydroquinone.

Flu virus inactivated by rays

A useful paper[8] has appeared on the inactivation of the influenza virus by low-voltage Roentgen rays. The PRS strain of influenza A virus has been eradicated in the dry state with 48 Kv. X-rays. The survival curve for the infectious variety was found to be exponential with respect to radiation dose. If this fact is taken to indicate a single-hit type of inactivation, a radiosensitive target 42 mμ in dia. was estimated as the size of the portion of the virus essential for infectivity.

The rate of inactivation of the haemaglutinin was affected by such variables as (*a*) the method of drying the virus, (*b*) the protective agent used in drying, and (*c*) the method of partial purification of the virus. It appears that these observations would make true target size difficult to establish.

When the virus was concentrated by ultra-centrifugation the X-ray survival curves for the hæmaglutinin were not exponential. The survival curve for the hæmaglutinin concentrated by absorption and elution was nearly linear. If the deviation from linearity were considered to be due to lability of dried virus the estimated target diameter was 17 mμ. The irradiation of the hæmaglutinin of ether disintegrated virus resulted in an exponential survival curve, and the experimental target diameter was calculated to be 23 mμ.

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FERTILISERS and Plant Nutrients

By D. P. Hopkins, B.SC., F.R.I.C.

Optimum use • Nitrogen and oats • Nitrate and cereals • Mildew New fertiliser plants • Drying and granulation • Phosphate concentration • Ammonia solutions

Optimum use

OPTIMUM fertiliser use, in terms of a new O.E.E.C. study,[1] is "that dressing which gives the largest net profit if present economic conditions are maintained." The factors bearing upon this are: likely crop increase per increment of fertiliser; cost of fertiliser; price obtained for crop; additional crop harvesting or marketing costs; residual effects. The new O.E.E.C. study is of striking interest for it tries to assess for each country what the total optimum fertiliser use should be, and thus arrives at a new kind of "index" for measuring national fertiliser efficiency—the percentage of optimum use that is scored by actual use.

There are difficulties in assessing figures of tonnage for national optima. Crop prices may vary considerably, especially when supply-and-demand law is the only price-making influence. Another major problem is to assess optimum use of fertilisers for grass; for an optimum rate per acre for grazed grass will be lower than for grass cut for silage, the value of the end-product being so different. Experts of each country considered in this study have assessed their country's optimum consumptions. Though the limitations upon accuracy should be borne in mind, it must be assumed that these estimated tonnages are reasonable guesses.

We therefore have a new way of comparing fertiliser use in different countries. Instead of the rather blunt comparison of rates used per acre, we can compare the gap between real and optimum use. This is a preferable approach because a high rate per acre in one country may be influenced to some extent by favourable crop price receipts; whereas the relationship between actual and optimum use takes into full account all such economic influences. Here are the figures for some of the countries:

Percentage of Optimum represented by Actual 1956-57 Use

	%		
	N	P	K
Belgium ..	68	75	91
Denmark ..	64	82	79
Germany ..	73	78	81
Netherlands ..	71	(over) 100	(over) 100
Sweden ..	71	58	61
U.K.	*51*	*80*	*56*
Ireland ..	20	21	19
France	31	33	24

So, by another method of comparison, British use of fertilisers is again shown to be less efficient than the use developed in a number of other European countries. Only our use of phosphate ranks well against these higher standards. The use of nitrogen lags behind quite

emphatically. Moreover, as other tables of data in the O.E.E.C. report show, in some of these higher-using countries, bolder standards for nitrogen optima with grass are taken, *e.g.*, for hay from temporary grass, the Belgian optimum N rate is almost 3 times that for U.K., the Dutch rate is half as much again.

The new study is a beginning, and further international co-operative work will undoubtedly improve means for assessing optima. The percentage figures (as above) provide a valuable guide towards potential expansion that is also a challenge to all advisers.

Nitrogen and oats

Although modern work, including the development of new varieties, has substantially increased nitrogen application rates for wheat and barley, there has been little similar progress with the oat crop, which in the U.K. as a whole represents a very large proportion of the cereal acreage.

Oats trial results for 1951-56 have been reported from Scotland.[2] Twenty-one tests in various Scottish areas compared nitrogen (as *Nitro-Chalk*) when given early, medium-early, late, and split into two dressings, and these tests were carried out at two rates, one twice the amount of the other. The actual nitrogen rates used varied, however, from centre to centre. One conclusion reached differs from past experience with this crop—namely, there is no gain in not applying all the intended nitrogen early, *i.e.*, when sowing or just before sowing. Lodging, more likely and more troublesome with oats than with wheat or barley, seems unaffected in incidence by nitrogen timing, though its occurrence is more probable at higher N rates, irrespective of their timing.

Despite variations in N rates at the different centres, the responses of yield to N could be calculated from the data. The average response to a standard N rate of 28 lb. an acre (equivalent to about 1·7 cwt. of *Nitro-Chalk*) was 3·1 cwt. of grain and 5·5 cwt. of straw. This may be compared with English trial figures (1945-55)[3] which showed for the same amount of N per acre a response of only 1·2 cwt. of grain for spring-sown oats, but 4·1 cwt. for autumn-sown oats. This work also showed no gain from applying nitrogen later than sowing time. However, the number of oats tests in England and Wales over the past 10 years has been inadequate. The new Scottish results at least indicate a more hopeful relationship between nitrogen treatment and oat yield. This could be due to heavier phosphate treatment, stimulating earlier growth and increasing the demand for nitrogen in the early development period. It may also be due to the introduction of new varieties. In the same trials spraying with urea solutions was tested, but this method of supplying nitrogen to the crop was not superior to normal solid N dressings even in 1955, the driest season of the trials.

Nitrate and cereals

With increased production of ammonium nitrate (see above) there will be a trend for more N to be given to crops as nitrate and rather less in ammonium-ion form. In this connection field tests with a nitrate fertiliser for spring-sown wheat and barley recently reported[4] are of some interest. An imported calcium nitrate product was used, one containing 5 parts of calcium nitrate to 1 part of ammonium nitrate. Comparisons were made with sulphate of ammonia at two N rates, 0·3 and 0·6 cwt. per acre (as N). Broadcast, both fertilisers gave like yields. With combine-drilling—largely, of course, the method now used—the nitrate fertiliser tended to retard germination and early growth, especially at the higher N rate. This was reduced as a tendency if adequate rain fell after drilling. It is said that there appears to be no similar tendency with sulphate of ammonia. With barley, combine-drilling gave higher yields than broadcasting when sulphate of ammonia was used at both rates; but this occurred for the nitrate fertiliser only at the lower N rate. This difference was not found for wheat.

Potash and mildew

The incidence of powdery mildew with wheat has been related to fertiliser and manure applications[5]. The worst outbreaks occurred when N and P had been given in the absence of potash. By providing potash, however, the amount of infection was much reduced; this beneficial effect could not be secured when magnesium or sodium was used instead of potash. The least infection was observed when the treatment was the high rate of 14 tons of farmyard manure per acre, but as this dressing in fact supplied 2½ times as much potash as was given in the fertiliser-only tests, it is concluded that the beneficial influence of the manure is mainly due to its high potash content. This work confirms the old view that potash promotes disease-resistance, or perhaps more accurately, that potash deficiency makes crops susceptible to infections.

Three new plants

Three outstanding developments in Britain's fertiliser industry have taken place recently. I.C.I.'s Billingham works has been enlarged[6]; the Shell nitrogen fixation works in Essex has been opened[7]; and Fisons' have opened a new nitrogen factory, adjacent to the Shell works.[8] The I.C.I. venture brings a large increase in the output of their CCF product, supplies of which have been somewhat limited. The Shell venture is an oil-based fixation process making ammonia, which is in turn partly-converted into nitric acid, with ammonium nitrate as the final product. Capacity is 75,000 tons p.a. of ammonia, of which 15,000 tons are scheduled to be converted into ammonium nitrate, all of which will be used to manufacture *Nitra-Shell*, hitherto imported from Holland. The remaining 60,000 tons of ammonia is sold as such to the adjacent nitrogen factory of Fisons; there, too, the ammonia is converted into ammonium nitrate.

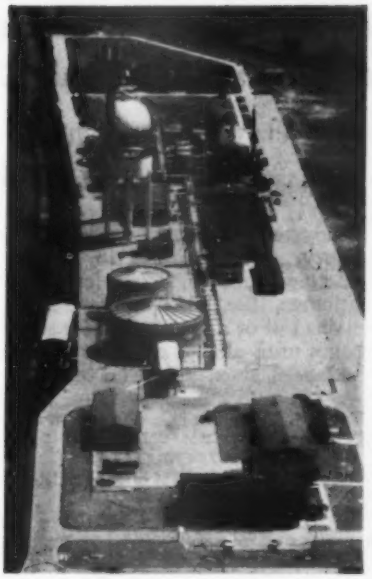
Two impressive technical innovations are associated with the new Fisons' factory. The nitric acid conversion plant is almost self-supporting for energy, the heat released in the reaction being recovered to provide all needs except minor requirements for pumps, etc. The second is the method of utilising the ammonium nitrate. This is produced as a hot concentrated solution. The solution is 88% ammonium nitrate and to prevent crystallisation it is stored at 120°C. Road and rail tankers that can keep this solution liquid (which requires a minimum of 85°C.) deliver this form of liquid nitrate daily to the company's other factories in diverse parts of England. It is used at these factories for part of the nitrogen requirement in making high analysis compounds. The fluid form is considered to be worth its cost of maintenance for all the ease of handling thereby secured. Production has been stated to be 400 tons of ammonium nitrate per day,

amounting to some 140,000 tons p.a. Its use will displace sulphate of ammonia formerly used in making compounds.

It is not known what the I.C.I. expansion represents in terms of additional nitrogen output. The Shell project adds 75,000 tons of ammonia to national production. As 15,000 tons of this is planned to replace previously imported nitrogen, the real addition is the remaining 60,000 tons, equivalent as N (not NH_3) to about 50,000 tons. Present national use of fertiliser nitrogen is believed to be 325,000 tons. The minimum addition amounts, therefore, to about 15½% of national use. In fact, it is more than this because of the unknown I.C.I. increase and because it is possible that the new home-based production of *Nitra-Shell* exceeds in capacity the tonnage previously imported. It may be an underestimate to say that nitrogen production has been raised through these new 1958-59 developments by 25% of present national nitrogen use. In recent years annual nitrogen use has been expanding at rates of (approx.) 5½%, 2½%, 17½%, 3¾% and 8% p.a. Thus, it may take three years of expansion in N use, unless the rate exceeds that of recent years, to absorb the new additions to national capacity. It remains to be seen now whether during 1959-62 there is some surplus of nitrogen; if there is, it is likely to be in the form of sulphate of ammonia. The fact that British use is only 51% of optimum for this plant food has considerable relevance. These huge capital investments by major manufacturers reflect the confidence felt in further expansion of fertiliser use.

Granulation

An American paper[9] reports a comparison of co-current and counter-current drying carried out on an experimental basis, first in laboratory studies, then in a pilot plant. 6-8-4 and 12-12-12 formulations were used, but in relating this evidence to British production it must be noted that nitrogen solutions were used for both grades and this included some ammoniation. The major problem in granulation plant dryers is, of course, fume formation through the effects of heat upon the materials; secondly, there tends also to be some loss of nutrient content in the fume emission. The blunt conclusion of this



Fisons' ammonium nitrate factory at Stanford-le-Hope, Essex

work is that counter-current drying always gave better results. Visible fume emission occurs through the decomposing effect of temperatures above 275°-506° F. With greatest heat at the dryer throat where the hot gases enter, this site is where most decomposition occurs. With co-current drying, major sources of fume emission are particles adhering to the feed chute and feed lifters. With counter-current drying, the major source is fertiliser dust particles carried by eddy currents towards or into the furnace, the fumes created being brought back into the dryer by the hot gas flow. Less fume emission occurs with counter-current drying. Another advantage claimed for counter-current drying is a lower fuel demand.

Phosphate concentration

A paper from Formosa[10] describes the conversion of ordinary superphosphate (19·5% sol. phos. acid) into calcium mono- or di- phosphate or phosphoric acid by washing with water and concentrating the extract. The first two products are formed in the solid phase as concentration proceeds and may be separated; there is a low fluorine/P ratio in some of these phosphates making it possible for them to be used as animal feed supplements rather than as fertilisers. The acid obtained is crude but good quality triple superphosphates may be made with it. Also, the concentrated water extract, if reacted at 150° to 200°C. with phosphate rock, produces a high-analysis product, with total P_2O_5 contents of 42 to 43·5%.

Another phosphate fertiliser manufacturing contribution[11] raises again the old topic of fusion processes for rock. In this new method, the by-product gypsum from wet process phosphoric acid manufacture is fused with phosphate rock; products with P_2O_5 contents of an availability exceeding 90% were obtained from fusing 3 : 1 mixtures of the gypsum and rock; actual P_2O_5 contents, total, ranged from about 7 to 16%, but on a pilot plant scale the products obtained had from 10 to 14% total P_2O_5 contents. Accompanying laboratory tests showed that mineral gypsum was somewhat superior as a fusion reactant to the by-product gypsum, and a possible explanation is the higher silica content of the mineral material. Fusion temperatures ranged from about 2350° to 2500°F.

Ammonia solutions

A new U.S. patent covers an apparatus for increasing the amount of ammonia that can be absorbed by water when liquid anhydrous ammonia is converted into an aqueous ammonia solution for use as fertiliser.[12] The obstacle to highest possible absorption and retention is the heat of solution of ammonia, which raises the solution's temperature steadily and thus reduces ammonia's solubility. Cooling is an obvious answer to this difficulty, but with this apparatus advantage is ingeniously taken of the cooling effect that occurs when gaseous ammonia under pressure is reduced in pressure.

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The Determination of the Moisture Content of Gelatine and Animal Glue

A Check of New British Standard Methods

By J. E. Eastoe and A. P. Williams*

THE British Standard methods[1,2] for determining the moisture content of a gelatine or animal glue have, for many years, involved weighing 1 g. of the sample into a tared stainless steel dish fitted with an aluminium cover. Ten-ml. of water are added and the sample allowed to soak. The dish is placed on a water-bath to dissolve the sample and to obtain a homogeneous solution. When most of the water has evaporated the dish is transferred from the water-bath to an oven maintained at 105°C. The dish is weighed after 2 hr. in the oven, followed by return to the oven for ½ hr. and a further weighing. Further ½ hr. heating periods are given until the weight is constant to 1-mg.

The British Standard methods have recently been revised[3,4] and will require a single drying time of 18 ±1 hr. at 105°C. The previous method was unsound because, since continuous moisture loss occurs, a false equilibrium could be attained resulting from equality of the moisture loss in ½ hr. at 105°C. with the moisture pick-up in handling and weighing. The measurements described below have been carried out to test the reproducibility of the new method and also its relation to shorter drying times.

Time of drying

Hitchcock[5] indicated that complete drying requires a number of days at a temperature below 100°C. to avoid decomposition. The present experiments, however, show that with very thin films, such as are obtained in the British Standard method, overnight drying is convenient and sufficiently reproducible for all industrial purposes. From this point of view, the absolute value, even if definable, is not of practical importance.

The procedure of the British Standards[3,4] was followed except for the time of drying. The thermostatically controlled oven in which drying was carried out had been previously adjusted to reach a steady temperature of 105°C. when empty. On introducing moist gelatine films into an oven so adjusted, the air temperature remained at or about 100°C. for some hours until almost all the moisture had been given off. The temperature then rose and remained at 105°C.

The results in Table 1 confirm that the 2 hr. drying period suggested for the initial weighing in the original British Standard methods is insufficient. For bone glue not only was there an increase of 1·84% in the moisture content when the drying time was extended from 2 to 4 hr., but also the results at the short times were not reproducible. On the other hand the moisture content of both the gelatines and glue appear to be changing only slowly after 18 hr. drying and the reproducibility was much more satisfactory.

Table 1. The moisture contents of gelatines and glues determined using various drying times

(Loss in weight as % of original weight)

Time of drying (hours)	Values of replicate determinations				Mean	Range
Gelatine A						
2	14·17	13·89			*14·03*	·28
3	14·36	14·31			*14·34*	·05
4	14·63	14·84			*14·74*	·21
5	14·85	14·94			*14·90*	·09
6	14·76	14·79	14·92	14·72	*14·80*	·20
16	15·11	15·11	15·11	15·03	*15·09*	·08
64	15·21	15·17	15·16	15·13	*15·17*	·08
Gelatine B						
2	14·15	14·05	13·82		*14·01*	·33
4	14·58	14·70	14·48		*14·59*	·22
6	14·51	14·41	14·59		*14·50*	·18
8	14·80	14·87	14·68		*14·78*	·19
12	14·96	14·93	15·01		*14·97*	·08
16	14·82	14·76	14·65		*14·74*	·17
18	14·72	14·72	14·67		*14·70*	·05
24	14·62	14·60	14·61		*14·61*	·02
48	14·98	14·88	14·93		*14·93*	·10
Bone Glue C						
2	12·10	12·55	12·47		*12·37*	·45
4	14·36	14·28	14·00		*14·21*	·36
6	14·23	13·96			*14·10*	·27
8	14·08	14·33	14·50		*14·30*	·42
12	14·76	14·52	14·68		*14·65*	·24
16	14·42	14·37			*14·40*	·05
18	14·42	14·39	14·21		*14·34*	·21
24	14·47	14·30	14·26		*14·34*	·21
48	14·70	14·69	14·70		*14·70*	·01

Constancy of drying temperature

As mentioned above, an oven, regulated to maintain an air temperature of 105°C. when empty, maintains a temperature of only about 100°C. so long as it contains moist material. For this reason it is difficult to see how the drying oven can be maintained at 105°C. to dry gelatine at that temperature, when drying times of the order of 2 hr. only are employed. Where sufficiently long drying times are used the oven is able to reach its equilibrium temperature. Since it is important to know how closely the temperature needs to be controlled for a given degree of accuracy, an experiment was carried out in which four replicate samples of

Table 2. Moisture content of gelatine determined by drying at various temperatures for 16 hr.

Temperature	Moisture content: Replicates				Mean	Temp. coef. of apparent moisture content per deg. C.
102°C.	14·78	14·76	14·88	14·80	14·81%	0·047%
105°C.	15·01	14·94	14·93	14·92	14·95%	0·063%
108°C.	15·04	15·15	15·22	15·16	15·14%	

Table 3. The moisture contents of gelatine and glue determined by drying for 18 hr. in four different ovens

Gelatine B: Values of replicate determinations			Mean	Range	Oven	Bone Glue C: Values of replicate determinations			Mean	Range
14·72	14·72	14·67	*14·70*	0·05	A	14·42	14·39	14·21	*14·34*	0·21
14·75	14·65		14·70	0·10	B	14·34	14·32		*14·33*	0·02
14·66	14·70		*14·68*	0·04	C	14·47	14·53		*14·50*	0·06
14·80	14·80		*14·80*	0·00	D	14·64	14·60		*14·62*	0·04

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ground gelatine were dried for 16 hr. at each of three temperatures, 102°C., 105°C. and 108°C. The drying was carried out simultaneously in three ovens, in order to avoid errors due to variations of humidity in the oven air. The results are given in Table 2.

An increase of 1°C. in the temperature at 105°C. therefore corresponds to an increase of 0·05 in the moisture value. In view of the uncertainty in the moisture content value introduced by the effect of the moisture films on the dishes and the varying humidity of the oven air, a variation of ±0·05% on the actual moisture figure is the least variation which can be expected between determinations on the same sample on different occasions. Therefore it is sufficient if the oven temperature is maintained at 105°C. ±1·0°C.

Reproducibility of results after 18 hr. drying

To test the reproducibility of the new British Standards methods the moisture contents of a gelatine and glue were determined by drying for 18 hr. in four different ovens maintained at 105°C. The results are presented in Table 3.

In the 9 results for gelatine B the range is 0·15, i.e. ±0·1%, of the original weight, whilst in the 9 results for bone glue C the range is 0·43, i.e. ±0·2%. Since 0·10% corresponds to a total error of 1 mg. in the weighings, ±0·10% is a reasonable estimate of the deviation of a single determination from the mean of a number of determinations. It was therefore concluded that the reproducibility of the new British Standards method was good and that it was suitable for the routine determinations of the moisture content of gelatine and animal glue.

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BOOK REVIEWS

The Merchants Of Life

By Tom Mahoney. Harper and Brothers, New York. Pp. 278. $3.75.

THE American pharmaceutical industry has grown more than tenfold since 1940 and it now spends some $130m. a year on research and development. In 1939 sales of the 1,100 companies in the field totalled only $150m. at the manufacturing level; in 1957, with only some 200 additional companies, this figure had exceeded $1,000m., a vast increase which can be attributed to the fact that the industry invests roughly half of its earnings in new facilities and more research, a policy which the British pharmaceutical industry might strive to emulate.

In *The Merchants of Life* Mr. Mahoney describes the origins, growth and development of some of the largest American pharmaceutical companies. They have been selected either for their size or their development of original products. The first two chapters describe the growth of the industry and also some of the problems of research; for example, in every 2,000 compounds studied only about three will be capable of being marketed as drugs, and of these less than 10% will be important enough to be prescribed widely, whilst only another 10% will pay their way.

The remaining chapters are company histories. Almost all the firms described have risen from very humble beginnings in about the middle of the last century, and their growth emphasises the vigorous development of American pharmacy. There is also a chapter describing the Swiss companies of Ciba, Geigy, Sandoz and Hoffmann-La Roche and their American associates, and one devoted to Burroughs Wellcome and Co.

The book is well written and should interest the general reader as well as people in the pharmaceutical industry.

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May's Chemistry of Synthetic Drugs

Fifth Edition revised and rewritten by G. Malcolm Dyson in consultation with Percy May. Longmans, Green. Pp. vi + 678. 110*s. net.*

A REVIEWER of a book of this wide scope must inevitably be perplexed by such basic questions as "What help can be given to readers of this review in deciding whether the book will help them?" Most, I suspect, will buy or borrow the book on the title and the prestige of the authors and judge for themselves; libraries of substance will be bound to replace the fourth edition, dated 1939, by this, the fifth edition, 20 years after. But the appearance of a work of substance such as this must give rise to some searching questions on the wisdom of trying to bring up to date a work conceived in what must be regarded as a bygone age of chemotherapy. Should we not think of the first decade of the twentieth century as the beginning of a renaissance epoch of Iatro Chemistry, inspired by the great Ehrlich? Since then chemotherapy has developed at an ever-increasing rate in ever-widening ramifications to the extent that no one person can conceivably keep pace with progress. To criticise Dr. Dyson for not achieving the impossible would be unfair; moreover, the title—"May's Chemistry of Synthetic Drugs"—is disarming. "May's Chemistry" means presumably just what May intends it to mean, and on that frankly personal description we must accept or reject. But it is surely fair to ask the authors what readers they had in mind and what purpose they hoped to achieve. The preface does not help much; it justifies the reclassification of the subject matter on a therapeutic action basis rather than a chemical one, but it does not state what are the criteria for the authors' selection of the synthetic drugs included. Still more important, it does not indicate the date up to which they have studied the published literature. But the impression is that very few developments after 1950 have been included and the last decade has brought significant changes, both by addition and

subtraction, to the range of accepted drugs. There is much matter concerned with chemotherapeutic studies in the laboratory and with compounds which have not found much practical use. Does the title of the book justify this? For whom then is this book intended? If for students, then it should be made clear that many of the synthetic methods described are obsolete (it may be justifiable, for example, not to re-write the 1939 section on acridine antiseptics and thus omit 5-aminoacridine, but it is naïve, if not misleading, to quote Benda's 1912 method for preparing proflavine). If for the specialist in chemotherapy, then the book is too much out of date. If for the general reader, then it may convey an inaccurate picture of the contemporary scene in drug research and technology. There is, of course, much valuable information assembled and well presented in this book and it would be churlish to be ungrateful for this. But this reviewer hopes that before another edition is contemplated the younger author will devote his ingenious mind and almost unrivalled knowledge of chemical literature to the challenging problem of providing up-to-date but severely critical books on this subject.

H. J. Barber.

Modern Pharmacognosy

By Egil Ramstad, Ph.D. McGraw-Hill, London. Pp. viii+480. 81s. 6d. net.

This is a first edition. The author was formerly at the School of Pharmacy, Oslo, and is now Professor of Pharmacognosy at Purdie University, U.S.A. He has based his text on a chemical classification of drugs of biological origin and has considered each group from a biogenetic standpoint. Knowledge of biogenesis is often incomplete and to fill the gaps Prof. Ramstad makes suggestions, but he rarely gives references to the original literature. Some physiological and pharmacological statements are included, as well as aspects of pharmaceutics, such as the preparation of serological products.

Part I (28 pages) contains a brief history of the development of materia medica. Part II, forming two-thirds of the book, deals with the following groups, in the number of pages indicated: carbohydrate (40); fatty acid (22); tetracycline (4); steroid (40); isoprenoid (46); phenylpropide (18); gallotannin (8); flavonoid (3); anthranol (12); proteid (76); purine, etc. (13); alkaloid (43), and products from fermentation (10). A short biogenetic discussion introduces each group, usually with about 30 structural formulæ on two adjacent pages to illustrate the chemical relationship between members of the group and also the probable precursors. A consequence of the chemical classification is that vitamins, antibiotics, volatile oils, glycosides, etc., are found in more than one chapter. Cross-references between chapters are essential; they are adequately given in the text and index. A taxonomic classification of the material is also indirectly available, for whenever a species is mentioned its family is also named and both are indexed. In Part III, ten pages usefully outline the types of chemical reaction which are involved in biogenesis; and the remaining 38 deal sketchily with the commercial aspects of drug production, and the preservation, storage and analysis of natural drug products. Plant production, and insect pests in vegetable drugs, are not described, but there is a small instructive section on the factors influencing vegetable drug activity.

There are no line drawings of macroscopical or microscopical characters of vegetable drugs. This fundamental part of the subject must be sought elsewhere; all chapters conclude with a list of books and films. The magnification of objects in the photographs might have been indicated by the presence of a cm./mm.-ruler rather than by paper clips, keys, wristwatches, etc. But there is hardly a page without an up-to-date illustration, or helpful graph, or chart (for example, that showing the industrial synthesis of some therapeutic steroids), and much information has been tabulated. The biogenetic approach is original in such a textbook; the range of natural drugs dealt with is exceedingly wide. While the text was written primarily for American pharmacy students, it would make worthwhile reading for students in this country and for hospital pharmacists and all interested in natural drugs.

Roland Hardman.

Writing a book?

The publishers of MANUFACTURING CHEMIST invite the submission of manuscripts of books to be considered for publication. All manuscripts will be promptly acknowledged and carefully considered by qualified experts. A synopsis with chapter headings should be sent in the first instance to The Manager, Leonard Hill (Books) Ltd., Leonard Hill House, Eden Street, London, N.W.1. Leonard Hill are specialists in industrial, technical and scientific books. They have a reputation for vigorous and successful promotion of their books by extensive advertising and maintain a world wide selling and distributing organisation.

Practical Formulary

By W. R. Minrath. D. Van Nostrand Co., London. Pp. 336. 45s. net.

This is an American book of formulæ for a wide range of household products. It will interest the keen amateur experimenter who likes making his own cleaners, polishes, paint, cosmetics, etc., and it should trigger off ideas among small manufacturers with local markets. Each chapter begins with general information about the application of formulæ in that chapter and with notes on the products concerned. The book begins with a few pages of advice and warning—advice on formulæ selection, procurement of ingredients, equipment, packages, etc., and warnings about labelling requirements. There is a list of ingredient suppliers and a good index which makes it easy to find formulæ. Many formulæ specify American branded products, which does not make the book easy for non-Americans to use. These brand names should have been translated into generic terms so far as possible.

Over 800 formulæ are packed into the book. They fall into these categories: wood surface treatments; lacquers and paints; metal polishes; cement, plaster and glass; cleansers and polishes; photographic products; cosmetics and toilet preparations; food; farm and garden products. The book is well produced and is good value at 45s.

PLANT AND EQUIPMENT

▶HOLLOW PLASTIC FANS

Marston Excelsior Ltd., a subsidiary of I.C.I., have acquired from the Hudson Engineering Corp. of Houston, Texas, manufacturing rights for Hudson hollow plastic industrial fans in the U.K. The fans will be sold under the trade name *Marex*.

Initially, the standard range will consist of four-bladed fans ranging from 6 to 14 ft. dia. in increments of 2 ft. dia. A set of hollow plastic blades may be fitted to two types of hub, either the auto-variable hub, which by means of a pneumatically activated diaphragm alters the angle of pitch while the fan is in motion, or the adjustable pitch hub, which requires that the fan be stopped while a manual alteration of pitch is carried out. On both hubs the angle of pitch may be varied between −15° and +30°.

Advantages claimed for the fans over conventional wooden and metal types lie in the materials, method of construction and the aerofoil shape. Blades are made of woven glass cloth and pigmented epoxy resin, laminated as a one-piece moulding. These materials make a self-coloured blade, which is corrosion- and heat-resistant, while the method of construction is stated to give blades of smooth surface, high strength and low weight: a set of blades for a 10 ft. dia. fan weighs 58 lb. Fan blades of the same size are interchangeable as all blades are balanced at the works to a standard value.

▶TITRATION STAND

A titration stand for six burettes made by Baird and Tatlock (London) Ltd., comprises a rotatable spider to hold the burettes and feeder tubes, mounted on a vertical stainless steel rod which is fitted to a tripod base with rubber feet. The three legs fit into a collar round the vertical rod, the rod and legs being held in place by Allen screws. The height of the rod can be adjusted and a suitable Allen key for assembly and adjustment is provided with the stand. The spider has six pairs of arms, each set of arms carrying a pair of polythene coated spring clips to hold a burette, and a label holder with a slip-on plastic cover. The spider also carries six polythene coated spring clips between the arms, to hold the lower ends of the six glass feeder tubes, and a second stainless steel rod fitted with a collar carrying six similar clips to hold the upper ends of the tubes. The feeder tubes are normally connected to reservoirs above the level of the stand in which the reagents are stored. The lower ends of the tubes are connected to aspirator type burettes held in the stand.

Skysorlift hydraulic scissor action elevating trolley, made by Farrow and Jackson Ltd.

The spider will rotate through 300°, with indexing at each 60° interval, enabling each burette to be brought into position in turn. A fixed stop prevents the spider from being rotated through more than 300° and thus tangling the connecting tubes to the reservoirs.

The stand will accommodate either 25 ml. or 50 ml. burettes fitted with two-way stopcocks, and is supplied with feeder tubes but without burettes and rubber connections.

▶ELEVATING TROLLEY

Skysorlift is the name of a new hydraulic elevating trolley produced by Farrow and Jackson Ltd.

An inclined or horizontal hydraulic ram, lifting heavy duty metal scissor guides, through cams and rollers, provides a strong, positive and smooth action elevating trolley, said to be suitable for long periods of heavy work.

The lifting mechanism is actuated by either a foot or hand operated pump, the pump unit being provided with a release valve that allows for controlled descent. The minimum lowered height is 9 in. and a varying range of lifts can be supplied to suit individual problems and applications.

The trolley is fitted with either four swivelling wheels or two fixed wheels and two "stillage" type feet and standard "tug-lift." Individual wheel braking is also incorporated.

▶AIR VELOCITY INDICATORS

Two low-priced air velocity meters are available from the Shandon Scientific Co. Ltd. They are the *Florite*, a bridled vane anemometer, and the *Floret*, a small pocket indicator.

The *Florite* is a circular instrument with a die-cast housing, 4 in. in dia. and 1¾ in. deep. The rotating peripheral scale, 8 in. long, gives direct readings in ft. per min. or m.p.h. Two scale ranges are available, 0-1,000 ft./min. and 0-3,000 ft./min., the latter scale also bearing graduations in m.p.h. The readings are automatically averaged over an area 3 in. in dia. and accuracy is guaranteed within 2% of full-scale reading. A zero adjustment is provided.

In operation the instrument is held to the air flow and the reading taken. The rotor is magnetically damped to level out insignificant variations in velocity and to bring the scale rapidly to rest. A scale lock, released by a spring-loaded trigger, enables readings to be locked on the scale—a useful feature when the instrument is being used in places where the scale cannot be seen. The lock may be permanently released by turning a screw. A detachable handle is provided, to which may be screwed a long extension rod for reaching particularly inaccessible places. In such cases the scale lock trigger is operated by a cord.

Two models of the *Florite* are

offered. Model MRF is for normal use, model MDL is fitted with a special scoop for measuring air flow from square or circular ceiling diffusers or louvres.

The *Floret* is a pocket instrument, providing instant direct readings on a 2½ in.-long sector-scale graduated in equal-sized divisions from 0-1,000 f.p.m. It is entirely self-contained and requires no hose, probe or other auxiliary fittings. It operates in any position.

"Florite" air velocity indicator.

▶POWDER FILLER

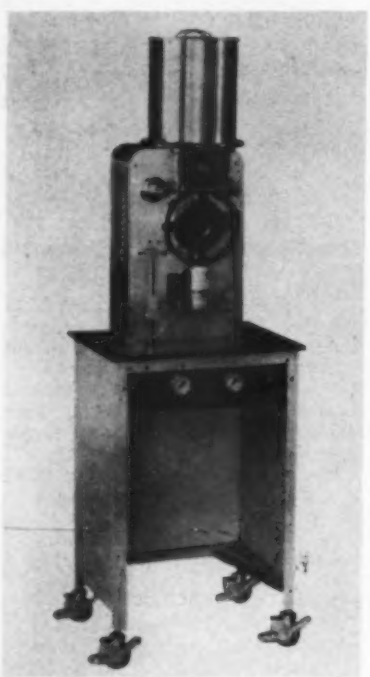
The model "G" *Perry Accofil* powder filling machine designed especially for the aerosol trade is marketed by the Flexile Metal Co. Ltd., who are the representatives for the manufacturer, Perry Industries Inc.

The filler consists of a bulk hopper into which the powder is placed. This hopper is positioned over a die wheel (filling head) which may be adjusted to fill containers ranging from 1½ in. to 12 in. in height and ¾ in. to 6 in. in dia. It is stated that round, square or oval containers can be filled with a high degree of accuracy and without dusting during the filling operation. Twin agitators in the hopper and hopper well keep the powder from caking or bridging while being fed to the die wheel.

Rotating either clockwise or counter-clockwise below the hopper is the die wheel or filling head which is equipped with two, four or eight ports depending upon the size and speed of fill required. The ports are equipped with pistons, the heads of which have a sintered stainless steel or felt disc which is said to permit the passage of air, but to prevent the finest powder from passing through. The pistons are adjustable within the ports in order to obtain the desired weight of fill to be placed into the containers. When any one port of the die wheel is positioned under the hopper, the vacuum cycle draws the powder into the port and removes the air from the powder at the same time. Thus, a semi-solid slug of powder, round, square or oval in shape, is formed within the port. The die wheel then rotates clockwise or counter-clockwise, whichever is desired. The excess powder is removed from the wheel by the use of a doctor blade positioned in the hopper well which rests on the periphery of the wheel.

When the powder-filled port revolves into position over the container to be filled, the cycle automatically changes from vacuum to pressure and forces the slug of powder from the port into the container.

Except for the hand-feeding of the containers, the machine is fully automatic. According to the manufacturers a dexterous operator can feed and fill the containers at a rate of from 15 to 30 per min. The fill range for this model is from a fraction of a gram to 25 lb. The powder filler can be equipped with a conveyor, making it fully automatic, and is mounted on wheels.



Model G. Perry Accofil powder filler.

▶A-A SPECTROSCOPY

Atomic-absorption spectroscopy is the measurement of the depletion of a beam of light as it passes through a population of free atoms—usually a flame. The depletion is due to the resonance of the light with the free atoms and occurs at distinct frequencies characteristic of the absorbing elements. Since an absorption line is extremely narrow, its intensity cannot be measured accurately against the background of a continuous spectrum; therefore monochromatic light at the resonance frequency must be used.

Atomic-absorption equipment made by Hilger and Watts Ltd. consists of a hollow-cathode lamp emitting light of the resonance frequency, and a specially designed flame-vaporiser. It is designed for use with the Hilger *Uvispek* spectrophotometer, but may be used with similar spectrophotometers. It is best used with recent models of the *Uvispek*, for then the spectrophotometer needs no modification, and may be used for normal spectrophotometry without dismantling the equipment.

Hilger hollow-cathode lamps are available containing most metals, but lamps containing other metals can be made to customers' specification.

The flame-vaporiser consists of two units; a vaporiser and a burner. The vaporiser atomises the sample solution before it is introduced into the flame, and is designed to give high reproducibility and a low rate of sample consumption. A mixture of the atomised sample and air passes from the vaporiser to the burner where it mixes with a suitable inflammable gas and enters the flame. The burner spreads out the flame to give as long an absorbing path as possible. The spectrophotometer, set at the resonance frequency of the element being determined, receives the light from the hollow-cathode lamp after it has passed through the flame. By comparing the intensity of the light before and after the sample has been sprayed into the flame, the depletion due to atomic absorption can be found, and this represents the concentration of the element in the flame, and therefore its concentration in the sample.

▶LABORATORY SHAKER

Designed to minimise noise and vibration, the *Bara* shaker made by Baird and Tatlock (London) Ltd. is of robust construction with all parts fitted for silent operation and for long service with the minimum of maintenance. The tray is made of sheet steel and rubber lined. It is supported on four rollers and is oscillated by a connecting rod from a crankshaft, driven from a geared motor by a V section canvas reinforced rubber belt. Racks are held rigidly in place by a quick release locking lever. An attachment to hold bottles is also available. The base of the shaker is made of sheet metal and is fitted with four rubber suction feet; a clip is provided at each end for permanent fixing if required. On the front of the base there is a mains switch and pilot light, and a rheostat control with an Off position.

The length of stroke is 1½ inches, and it is claimed that a rate of 275-280 oscillations per min. can be attained. The overall size of the equipment, which is finished in grey stoved enamel

is 30 in. × 11 in. × 8 in. high, and the weight is approximately 44 lb. The equipment is supplied with 4 ft. 6 in. of 3-cored rubber cable for connection to mains, and is available for operation on 100/120 V. or 200/250V., A.C. Racks and the bottle attachment must be ordered separately.

▶ELECTRONIC TANK GAUGE

A new model of the *Gilbarco* electronic tank gauge for use on deep storage tanks will shortly be available from Firth Cleveland Instruments Ltd. The new model, *CMB 107U*, is housed in a ductile iron case and meets American Class I Group D, Division I requirements for flame proofness. Official approval of this model by the Gilbert and Barker Manufacturing Co., U.S.A., has been granted by the Underwriters laboratory of Chicago, Illinois.

The gauge is stated to read the true level of the liquid in feet, inches and sixteenths, regardless of its specific gravity. It is power-actuated and can be adapted, it is said, to almost any type of remote transmission, providing the basic accurate data necessary for a co-ordinated system of remote transmission. The gauge can be equipped for automatic selection of temperature averaging resistance thermometers, and can be fitted with high and low level alarms.

All metals and other materials used in the gauge are selected to resist corrosion. It can be installed, serviced, re-calibrated and maintained without taking the tank out of service. The gauge may be installed to measure water level or the interface of two products.

▶DRIP-PROOF TAP

A drip-proof and reversible drum tap which, it is claimed, can be used with virtually any liquids, including paraffin, trichlorethylene, turpentine and others difficult to handle, is marketed by Phillips Telescopic Taps Ltd.

The tap is moulded in *Rigidex* high density polyethylene and is said to be resistant to a very wide range of liquids. There are no internal washers or glands and manipulation is by push button control giving immediate on and off action. With a 1 gal. head of paraffin the tap delivers 1 pint of filtered liquid in 10 sec.

In transit, the tap travels with the package either under the filter cap or reversed in ¾ in. gas screw fitting.

A continuous flange grip on doors and drawers is a feature of this all-metal unit laboratory furniture from the Griffin and George Group.

Kerotite reversible drum tap in high density polythene available from Phillips Telescopic Taps Ltd.

The B.T.L. Bara laboratory shaker. The tray will hold six Kahn racks.

▶FORK LIFT TRUCK

A small fork-lift truck, having a length of only 37 in. but stated to possess the advantages of the sit-on rider controlled trucks, is available from G. Hunter (London) Ltd.

Known as the *Piccolift*, the truck has a capacity of 1,120 lb. at 24 in. or 1,300 lb. at 20 in. load centres. The truck is three-wheeled and has an independent motor on each front wheel. Towing capacity is available up to 10 tons and height of lift from 60 in. up to 138 in. can be supplied. The drive is by electric traction batteries and cushion tyres are fitted as standard.

▶METAL LAB. FURNITURE

In collaboration with the manufacturers, Grundy Equipment Ltd., the Griffin and George Group have improved the appearance and durability of their range of all-metal unit furniture. As projecting handles were a nuisance, a " no-projection " feature was incorporated in the new cupboards and drawers. A continuous flange offers finger-grip space over the full width of door and drawer.

Special attention has been given to the adjustment and alignment of the drawers by the use of a simple cam on the drawer track, which is accessible from the front of the unit; a rubber buffer on the track makes for quiet operation. Other features include 1½ in. shelf centres, piano-type hinges, adjustable feet, and flashing strips which conceal all fixings.

▶DEIONISERS SIMPLIFIED

The mark 4 and mark 5 portable *Deminrolit* plants manufactured by the Permutit Co. Ltd. have been designed for " on the spot " regeneration of the exhausted ion exchange material, thus obviating the need for detachable cartridges and replacements. The makers state that since regeneration requires only small amounts of inexpensive chemicals running costs are reduced to less than a ½d. per gal. of demineralised water.

Both plants consist of a pair of sealed columns charged respectively with *Zeo-Karb* cation and *De-Acidite* anion exchange resins, the water being passed through the columns in that order. Flexible connection and delivery tubes, with a multi-valve control system, facilitate operation and regeneration. A built-in dial type conductivity tester enables " spot " checks to be made on the quality of water being produced. By this means the point at which regeneration becomes due may be determined precisely.

Regeneration involves flushing the cation column with a dilute solution of hydrochloric acid and the anion column with dilute caustic soda or soda ash solution. Both columns are then rinsed with water, when the plant is ready for further use.

NEWS . . .

Russian drugs and perfumes for Britain

During the year to June 30, 1960, the Russians will export to the U.K. £320,000-worth of medicines, drugs and pharmaceuticals and £50,000-worth of perfumery. In the same period the U.K. will export to the Soviet Union £100,000-worth of medicines, drugs and pharmaceuticals and £10,000-worth of toilet preparations. The Russians will thus sell three times more "chemical" goods than they will be buying from Britain.

The quotas have been established in the Anglo-Soviet agreement for a consumer goods trade of £3·4 million each way during the next 12 months. The biggest single item the Russians will be selling is canned crab (£1 million). Britain's best seller will be woollens (£700,000).

Anti-corrosion firm acquired

Cory Brothers and Co. Ltd., a member of the Powell Duffryn Group, has acquired the share capital of MacCleaster Chemical Co. Ltd.

The MacCleaster Co. will continue to operate under its own name and the present directors, N. R. MacCleaster and R. A. L. Thornton, will remain on the board. Additional directors appointed are Brigadier S. J. L. Hill (chairman) and John Wm. Davies, both also directors of Cory, and J. W. Franklin. The company's address is 8, Great Tower Street, London, E.C.3. Telephone MANsion House 4555.

MacCleaster Chemical, a private company formed four years ago, manufactures anti-corrosion compositions for the protection of metals which have wide applications in industry, shipping, etc. It is intended immediately to expand the company's production facilities.

Biological instrumentation

As a result of talks with Dr. Edwards of Bradford Institute of Technology, Mr. K. G. Sinclair, chairman of the Griffin and George Group of laboratory equipment manufacturers, has awarded two travel fellowships to Dr. Peter Ramwell of the Department of Pharmacy at the Institute.

Following the formation of Griffin and George (Research and Development) Ltd., a research group headed by Dr. A. J. P. Martin, F.R.S., it became evident that there was a need for a fellowship which would provide senior workers of established repute with facilities for travel abroad.

The Fellowships are intended for young scientists who already have made a worthwhile contribution to instrumentation, and who may, with suitable encouragement, make more significant advance than would otherwise be possible. It was decided, therefore, in consultation with Dr. Edwards, that the first of these fellowships should be in Biological Instrumentation and awarded to Dr. Ramwell for his work and interest in rapid response respiratory gas analysis.

During his first journey, in June and July, Dr. Ramwell visited Paris, Frankfurt, Brussels and Berlin; he visited Basle during late August and September.

Improved aspirin

An improved process for the manufacture of aspirin developed by Howards of Ilford Ltd. is said to give a product with particularly good tablet-making properties, stability and ability to resist unfavourable storage conditions over long periods.

The company has recently completed the first part of a major rebuilding programme at a cost of over £60,000, and the opportunity was taken to improve the manufacturing process and to increase plant capacity.

Detergents block drains

An aspect of detergents in sewage which is bothering country people who have to provide their own drains and settlement tanks is revealed by a Hampshire farmer. He complains that detergents in waste water leave behind a considerable sediment which forms into hard lumps which block the settlement tanks. This tendency of synthetic detergents could be a serious nuisance to the many people who do not have access to main drainage systems and is one which might be considered by the Committee on Detergents and Sewage.

Product range increased

Orgamol S.A., the principals of Jacobson Van Den Berg and Co. (U.K.) Ltd., have increased their range of products and can now supply meprobamate, procaine hydrochloride, amidopyrine, ferricholine citrate and dioxypropyltheophylline. This last is stated to be an improvement on aminophylline and to be water soluble and completely neutral.

Jacobson Van Den Berg and Co. (U.K.) Ltd. have been appointed agents of Franken Donders N.V., Tilburg, Holland.

New Plant Raises I.C.I.'s Petro-Chemicals Output

I.C.I.'s petroleum chemicals production has been further increased by a third olefine plant at Wilton Works, Yorkshire, which came into production a few weeks ago. The new plant raises I.C.I.'s total olefine capacity by 60%. With the other two plants there is sufficient capacity to process 600,000 tons of feedstock p.a. to yield about 230,000 tons of olefines. The feedstock is naphtha which is shipped from the Middle East and other refineries direct to Tees-side, whence it is piped to Wilton Works. The main olefine product is ethylene—output is now 110,000 tons p.a. which may soon be raised to 140,000 tons. About 90% of this is used to make polythene. The next most important olefine product is propylene which will feed the polypropylene plant due to come into production at Wilton in September 1960. Other Wilton plants depending on the oil cracking process are the *Terylene* plant, the detergents plant, and the synthetic rubber plant.

The Wilton olefine plants are operated by the Heavy Organic Chemicals Division which was formed last year under the chairmanship of Dr. S. W. Saunders. The Division also runs the oil works at the neighbouring Billingham Works which produce synthetic phenol, alkyl tar acids, alkylamines, "Oxo" products, isopropanol and acetone.

The new No. 3 olefine plant cracks naphtha into gases and crude motor spirit and operates at temperatures ranging from 2,000°F. to −200°F. A novel feature is a battery of free piston gas generators which drive the turbines for the many centrifugal gas compressors used in the new unit.

Change of address

Smith Kline and French Laboratories Ltd. have moved to Welwyn Garden City, Herts. Telephone: Welwyn Garden 5111.

Boots' biggest branch

What will be the largest of the 1,300 branches of Boots Pure Drug Co. Ltd. will be opened in Birmingham next month. It will have a total sales floor space of 24,000 sq. ft. and a staff of about 350.

New chemicals plant

The Blaw Knox Chemical Engineering Co. Ltd. has been awarded a contract by Petrolite Ltd., for a synthetic chemical compounds plant. Erection work has commenced at the Petrolite factory, Kirkby Industrial Estate, near Liverpool, and the plant is scheduled for completion this year.

People

B. E. A. Vigers has relinquished the position of assistant managing director and has been appointed a deputy chairman of Laporte Industries Ltd. and technical director of the Laporte Group of companies.

D. C. M. Salt, director of sales, has been appointed alternate to **J. W. Urban** on the board of Monsanto Chemicals Ltd. Mr. Salt, who joined Monsanto in 1935, has a wide experience and knowledge of the company's selling operations. He was appointed general manager of sales in 1956 and, prior to his recent appointment, was general manger of chemicals division.

The Scientific Instrument Manufacturers Association of Great Britain has appointed a new Director—**Capt. R. A. Villiers,** C.B.E., A.M.I.E.E., R.N. (RETD). At one stage in his career Capt. Villiers commanded the Underwater Countermeasures and Weapons Establishment of the Royal Navy at Havant—a research and development establishment.

Birlec Ltd. has established a Midland Area sales office with **H. J. Podmore** as manager. The office is at the company's main premises in Tyburn Road, Birmingham 24.

Mr. Podmore joined Birlec in April 1955 as sales manager, Dryer and Gas Plant Division.

S. P. Thompson has resigned from Imperial Chemical Industries Ltd. to settle permanently in New Zealand and in his place **A. J. Barrett,** now I.C.I. Heavy Organic Chemicals Division secretary, has been appointed I.C.I. Plastics Division secretary.

The trustees of the Plastics Industry Education Fund have appointed **H. T. Kemsley,** director and secretary, British Industrial Plastics Ltd., as their secretary in place of Mr. Thompson.

C. W. Maplethorpe, managing director of Allen and Hanburys Ltd., left London in September for a world business tour, and is due back on November 11. The principal countries to be visited will be U.S.A., Canada, New Zealand, Australia, Malaya, India and Pakistan.

Griffin and George (Sales) Ltd. have made the following appointments: **E. Bentley,** Manchester branch manager, has been made London branch manager; **K. Freer,** formerly buyer at the Manchester branch succeeds Mr. Bentley as manager, and **J. Branson** becomes Manchester assistant branch manager. **D. Savage** retains his post of Northern area field sales manager.

Dr. Robert F. Hudson has been appointed a group director of research at the Cyanamid International Research Institute in Geneva. He will take up his appointment early in 1960. **Dr. Volker Franzen,** of Heidelberg, has also been appointed to a similar post.

Dr. R. F. Hudson

Dr. W. A. Bullen has been appointed sales manager of the Boehringer Products Division of Pfizer Ltd. He will also act as deputy to the general manager, W. R. Miller. Dr. Bullen, who was for many years on the General Practitioners Panel of Pfizer Ltd., joined the company two years ago and was appointed Medical Director last year.

Dr. N. B. Dyson has been appointed to the new position of manager, production planning and control, for Monsanto Chemicals Ltd. Since 1953 he has been works manager and, later, general works manager at the company's factory at Newport, Mon. He has been with Monsanto for 25 years.

G. V. Taylor has been appointed works manager at Newport in place of Dr. Dyson. He was formerly assistant works manager and has been with the company since 1934.

K. H. Handy, works manager at the new Monsanto factory at Fawley, near Southampton, for the last two years, has been appointed works manager at the Ruabon, Denbighshire, factory. He joined the company in 1946.

A. E. V. Houchen, a director of the Beecham Group Ltd. and chairman of County Laboratories Ltd., has been appointed chairman of the Toilet Preparations Federation Ltd. Mr. Houchen, who has been a member of the council of the Federation since 1954 and senior vice-chairman during the past year, succeeds Mr. Budgett-Meakin of J. and E. Atkinson Ltd.

The Toilet Preparations Federation Ltd. was instituted in 1945 and is the official trade federation representing some 190 leading companies in the perfumery, toilet preparations and cosmetic industry. In recent years through the Federation's Committee of Specification Standards, useful work in setting standards of purity for raw materials used in the manufacture of toilet preparations and cosmetics has been done.

Dr. E. W. Bodycote, acting works manager at Ruabon, has been appointed works manager at Fawley. He joined Monsanto in 1947.

J. Wickihalter, export sales manager of Esrolko Ltd. of Dubendorf, Zurich, Switzerland, manufacturers of compounds, flavours and aromatic chemicals, will be in London in September and October, according to Jacobson Van Den Berg and Co. (U.K.) Ltd.

G. L. Thompson has been appointed managing director of Borax and Chemicals Ltd. He succeeds **W. J. Hatchley,** managing director since the inception of the company, who retired last month. Mr. Hatchley will remain a member of the board.

Alan B. Jordan has been appointed publicity manager of Edgar Allen and Co. Ltd. He succeeds **Eric N. Simons** who is, however, retained by the company as a consultant.

E. Ashford, who joined the company in 1923, has retired from the position of general works manager of Johnsen and Jorgensen Ltd. He is succeeded by **D. M. Curtis.** Mr. Ashford will continue to work for the company on special developments.

Sir Henry Jones, deputy chairman of the Gas Council since February 1952, will succeed **Sir Harold Smith,** K.B.E., as chairman on January 1, 1960. **W. K. Hutchison** will become deputy chairman. He has been chairman of the South Eastern Gas Board since its formation in 1948.

The British Gelatine and Glue Research Association have appointed **Dr. D. A. Sutton,** PH.D., B.SC., A.R.C.S., as Director of Research. He is expected to take up this appointment towards the end of October. He will succeed **A. G. Ward,** O.B.E., Director since the formation of the Association in 1948, who left at the end of August to take the Chair of Leather Industries at Leeds University.

Dr. Sutton is 41 and is at present chief biochemist of the South African Council for Scientific and Industrial Research Pneumoconiosis Research Unit at the Institute of Medical Research, Johannesburg, where he is in charge of investigations into the collagen in various lung constituents, the chemotherapy of silicosis and carcinogen liver protein bonding. He graduated with first class honours in chemistry at Imperial College, London, and after holding posts with the British Rubber Producers' Research Association and the Paint Research Station, went to Pretoria in 1949.

Dr. F. J. A. Bateman succeeds Dr. Bullen as director of Medical Services Pfizer Ltd. He joined the company in August last year.

H. Iredale Nelson has been appointed to the newly-created post of advertising manager of Diversey (U.K.) Ltd. and Deosan Ltd. He will handle all publicity for the range of Diversey and Deosan cleansing and sterilising products.

J. P. Elliott, secretary and director of Davey, Paxman and Co. Ltd., has been appointed assistant managing director of the company. Mr. Elliott joined Davey, Paxman and Co. Ltd. in 1943 as secretary and chief accountant.

Dr. G. Malcolm Dyson has been appointed Research Director for Chemical Abstract Services in the U.S.A. He tells MANUFACTURING CHEMIST that the job entails the application of automation to chemical documentation. He and his assistants are to try all kinds of methods for rapid automatic indexing, to speed up the issue of the conventional indexes and to add new types of index, hitherto unattempted; they are also contemplating an entirely new correlative type of data processing, storage and retrieval as the basis of a new chemical information service. Dr. Dyson will live in the United States about four months each year.

Dr. F. L. Rose, O.B.E., F.R.S., an associate research manager in the Pharmaceuticals Division of I.C.I., has been appointed Honorary Reader in Organic Chemistry to the University of Manchester, in the Faculty of Technology. Although a high percentage of industrial chemists receive their early training at the Universities, there has in the past been little opportunity, apart from occasional lecturing, for them to go back and assist in the instruction of the new generation of scientists. It is believed that in this connection fresh ground is being broken by the appointment of Dr. Rose, who had already anticipated his duties by a course of lectures which he gave to final-year honours students at the College of Science and Technology early this year. Beginning in the new academic term, it is proposed that he should supervise, in addition, a certain amount of post-graduate research at the College.

Polarographic society medal

A silver medal, to be known as the Polarographic Society medal, has been designed. This medal will be awarded periodically for outstanding work in polarography.

The first award was made to Prof. J. Heyrovsky for his discovery of polarography in the nineteen-twenties.

Fine herb crops at Long Melford

Stafford Allen and Sons, Ltd., report that herb crops on their farms at Long Melford, Suffolk are the best for a long time, thanks to the excellent summer.

Belladonna. The warm dry weather has produced a very good crop of first quality herb.

Chamomile. Although this crop did not make quite so much growth, the yield of oil has been high.

Clary Sage. This was another excellent crop with a very good yield of oil.

Digitalis. The final weight of herb harvested may be a little light compared with other years. Nevertheless, with the abundance of sun, the leaf can be expected to be of high quality.

Hyoscyamus. In this crop, again, there was not the bulk of herb, but the quality is good.

Lavender. On the new plantations set out last year, there was a good show of flowers, and a good yield of oil was obtained.

Parsley. The hot weather has been ideal for the parsley left for seed. It will ripen off well, and a high yield of oil is expected.

Peppermint. This has been a most successful crop, and the flowering mint made a wonderful picture. The yield of oil is very good and of excellent quality.

Poppy Petals. Again this year a reasonable collection of fresh petals was made.

Company finance

Albright and Wilson Ltd. showed a group profit after tax of £1,122,000 (£793,000) for the six months ended June 30. An ordinary dividend of 6% less tax was recommended.

The net profit of the **Distillers Co. Ltd.** for the year ended March 31, 1959, was £13,172,095 (£10,582,818). A final dividend of 8½% was declared, making a total dividend for the year of 12%.

Profits of **Monsanto Chemicals Ltd.** for the half-year ended June 30, 1959, were £348,400 (£284,100). A first interim dividend of 5% less tax was declared.

A net profit of £1,075,560 (£1,213,663) was shown by **Powell Duffryn Ltd.** for the year ended March 31, 1959. A final dividend of 10% less tax was recommended, making a total of 16% for the year.

Profit of the **Borax (Holdings) Group** for the nine months ended June 30, 1959, amounted to £1,846,535 (£664,020) after tax. An interim dividend of 1·75d. per 5s unit, less tax, was declared in respect of the year ended September 30, 1959.

Corrosion Exhibition 1960

The Corrosion Exhibition 1960 will be held from Tuesday, November 29, to Friday, December 2, and not as stated in the August issue.

Essential oils post

Jacobson Van Den Berg and Co. (U.K.) Ltd. state that Mr. E. A. Flack, who joined them earlier this year as sales manager, compounds and essences division, is now responsible for the import and home sales of all essential oils from their principals: K. H. Dhamdhere, Cochin, S. India; Gattefosse sfpa., France; Magnus Mabee and Reynard Inc., New York; Francesco de Pasquale fu Santi, Messina.

Seven cosmetic lectures planned

Seven lectures have been planned for the 1959-60 season by the Society of Cosmetic Chemists of Great Britain. All will be held at the Royal Society of Arts, John Adam Street, London, W.C.2. They are:

Monday, October 19
The Rheology of pastes, suspensions and emulsions, by G. W. SCOTT BLAIR.

Wednesday, November 18
Modern trends in formulations, by W. W. MYDDLETON.

Wednesday, December 16
Packaging and package testing, by G. L. RIDDELL.

Monday, January 18
The use of polyoxyethylene derivatives in cosmetics, by B. A. KILLNER.

Friday, February 12
The design of experiments, by M. H. QUENOUILLE.

Tuesday, March 15
Fragrance in the natural orders, by E. S. MAURER.

Thursday, April 7
Planning and equipping a cosmetic laboratory, by R. H. MARRIOTT.

The Annual Dinner/Dance will take place on Friday, February 5, 1960.

MEETINGS

Institution of Production Engineers

September 30. "Uses and Developments of Work Study," by W. C. Castledine. 7.30 p.m. Shrewsbury Technical College.

Society of Chemical Industry

October 5. "Polymerisation of Olefines Using Organometallic Catalysts," by Sir Robert Robinson. 6.30 p.m. Royal Institution, Albermarle St., London, W.1.

Society for Analytical Chemistry

October 13. "Modern Methods of Titration." 7 p.m. British Iron and Steel Research Association, Sheffield.

Pharmaceutical Society

October 14. "Evaluation of Disinfectants and Preservatives," by Dr. A. M. Cook. 7.30 p.m. 17 Bloomsbury Sq., London, W.C.1.

News from Abroad

DOMINICAN REPUBLIC

Soap and tooth-paste factory

A $400,000 factory for the production of soap, tooth-paste and haircream has been opened in Ciudad Trujillo by Colgate Palmolive. The factory has been made possible through facilities granted by the Dominican government. Staffed by Dominicans and using to a large extent Dominican raw materials, it is stated that the factory's initial production will enable imports of the company's goods from the U.S. to be cut by 60%. It is hoped that production, which can be increased by a further 75%, may also provide exports for other countries in the Carribbean area.

SOUTH AFRICA

Parke, Davis building

Parke, Davis and Co. has started building a branch in Johannesburg. It will be a combined manufacturing and sales concern and it is being built, at a cost of £200,000, on a 10-acre site near Jan Smuts Airport. It is expected to be completed this year.

Solvents available

National Chemical Products Ltd., Germiston, Transvaal, are producing a range of solvents, including ethyl acetate, butyl acetate, amyl acetate, ethyl alcohol and butyl alcohol.

Ethyl acetate is in big demand locally for the production of printing inks, thinners, making leather cloth and as a solvent for cellulose film and certain gums and resins used in the manufacture of surface coating. All the solvents produced by this company are made to British Standard specifications.

Production expansion forecast

The production of the South African chemical industry will increase to about £200 million in 1968, according to J. S. J. Kuschke, general manager, Industrial Development Corp. This is about £70m. more than the 1956 total.

He told a meeting in Pretoria recently that the industry had grown from 204 chemical producers in 1938—with a total production of £12 m. and about £5,600,000 invested in land and buildings—to 378 producers in 1956—with a total production worth £130m. and an investment of £85 m. in land and buildings. Twenty years ago, the industry had about 13,000 employees; in 1955-56 there were 43,000, and by 1968 the figure is expected to reach 66,000.

UNITED STATES

Mesyl chloride

The Stauffer Chemical Co. has increased its capacity to produce mesyl chloride at Chauncey, New York.

Mesyl chloride is a pale yellow, lachrymatory, highly reactive liquid, soluble in most organic solvents. It reacts with reducing agents, alcohols, phenols, ammonia, amines, active methylene compounds, and various other chemical groups. It is used as an intermediate in the manufacture of corticosteroids, dyestuffs, and other organic chemicals.

BRAZIL

New fertilisers plant

Solorrico S.A.—Industria e Commercio, Sao Paulo, has begun work on a new plant in the Lapa district of Sao Paulo city for the production of granulated phosphate fertilisers. The total value of the plant is Cr$42,000,000, the machinery having been partly imported from Germany under a licensing agreement. Production will be 42,000 tons p.a. of mixed granulated fertilisers.

The raw materials (potassium phosphate, ammonium sulphate, urea and potassium chlorate) will be mainly imported from the United States; the remainder from Germany. The plant, which covers an area of 8,700 sq. m., is reported to be the first of its kind in Latin America.

PERU

Caustic soda plant

Alcalis Peruana S.A., a subsidiary of W. R. Grace and Co., New York, are building a chemical manufacturing plant at Paramonga. It will be built in two stages, at a total cost of some U.S.$8 million. The first stage, due for completion by the middle of 1960, will permit a daily production of 25 tons of rayon-grade caustic soda, 22 tons of chlorine and 2 tons of bleaching powder, and the second stage, to be completed by 1962, will enable this output to be doubled.

Financial assistance towards the cost of the first stage is being afforded by the Export-Import Bank with loans of U.S. $840,000 to finance the purchase of machinery and services in the United States and of Soles 12 million in respect of local expenditure. The loans are repayable in five years, beginning 1961, and are guaranteed by Sociedad Agricola Paramonga Ltd. a leading producer of cane sugar and manufacturers of paper products, which is also a subsidiary of W. R. Grace and Co.

INDIA

Evans link-up

Evans Medical Ltd., Liverpool, have arranged with Biological Products Private Ltd., of Hyderabad, for the manufacture under licence in India of a considerable part of the Evans range of medical products. The Indian made products will be distributed by Evans Medical (India) Private Ltd.

New dyestuffs plant

A big extension to the vat dyestuffs plant of Atic Industries Private Ltd. at Bulsar, Bombay, was opened on April 9 by the Hon. Shree Manubhai Shah, Minister of Industry, Government of India. Its output will greatly strengthen India's dyestuffs industry.

Atic Industries Private Ltd. is a joint enterprise of Imperial Chemical Industries (India) Private Ltd. and Atul Products Ltd.

The new plant, which has cost about £1 million and has taken two years to complete, will make many vat dyestuffs, including vat purple, blues, blacks, browns, olive, yellow, orange and some solubilised vats.

The original Atic Industries plant has been making jade green dyestuffs since 1956.

AUSTRALIA

952 factories

The Australian chemical, drug and medicines industry now has 952 factories in operation. At June 30, 1958, employees numbered 41,910 and the year's salaries and wages totalled £39,408,000. Value of raw materials used was £107,254,000, and total value of output was £219,218,000. Average annual salary and wage was £974, value of output per person engaged was £5,231, and ratio of salaries and wages to value of production was 38·02%.

New acid plant burners

The new hydrochloric acid plants at the Yarraville (Victoria) and Botany (New South Wales) factories of Imperial Chemical Industries of Australia and New Zealand Ltd. are using mild steel burners which occupy only one-tenth of the area of the old plants which burnt the hydrogen and chlorine gas in silica-ware or brick structures and used a mass of silica pipes to absorb the acid gas.

The new plants combine steel burners with graphite absorbers, operating on the principle that hydrochloric acid gas is not corrosive unless it absorbs moisture. The new plants operate in the open air.

THE CHEMICAL MARKET

PALM KERNEL OIL UP

LONDON.—Refined deodorised **palm kernel** oil in 2-ton lots is up £16 to £150 per ton and **zinc oxide B.P.** in 2-ton lots has increased by £2 to £116 per ton. **Agar agar No. 1,** Kobe strip and powder, have increased by 2s. and 4s. 9d. to 15s. and £1 per lb. respectively, Sudan spot **beeswax** by 15s. to £24 5s. per cwt., **carnauba** fatty grey by 15s. to £31 per cwt. and **gum arabic** lump by £1 to £9 15s. per cwt. Sumatra spot **benzoin** has decreased by 10s. to £26 10s. per cwt. and refined deodorised **palm oil** in 2-ton lots is down £2 to £104 per ton.

FINE CHEMICALS

Acetanilide 12½ kg. 7s. 4d. kg.
Arsenious oxide B.P.
7-lb. lots 1s. 9d. lb.
1-cwt. lots 1s. 2d. lb.
Ascorbic acid
100 kg. £4 14s. kg.
Aspirin
56 lb. 5s. 2d. lb.
1-cwt. 4s. 11d. ,,
5-cwt. lots 4s. 9d. ,,
Atropine
Sulphate, 500 g. £59 18s. 6d. kg.
Alkaloid, 500 g. £68 15s. kg.
Benzene B.P.C. 28-lb. lots 1s. 8d. lb.
Benzoic acid 12½ kg. 7s. 4d. kg.
Benzyl benzoate
According to pack 5s. to 7s. 2d. lb.
Bismuth oxide B.P.C. 1934
28-lb. lots 26s. 10d. lb.
Bismuth salts 28-lb. lots:
Carbonate 22s. 3d. lb.
Subgallate 21s. 1d. ,,
Salicylate 21s. 9d. ,,
Subnitrate 20s. 5d. ,,
Borax B.P.
Powder £57 10s. ton
Extra fine £58 10s. ,,
Boric acid B.P.
Crystal £95 10s. ,,
Powder £93 ,,
Bromine B.P.C. 7-lb. lots 6s. lb.
Caffeine 50 kg. 42s. 6d. kg.
Calamine 50 kg. 4s. kg.
Calcium gluconate
1 cwt. lots dlvd. 3s. 7d. lb.
Calcium glycerophosphate
50 kg. 28s. 6d. kg.
Calcium lactate B.P.
7-lb. lots 2s. 11d. lb.
1-cwt. lots 2s. 4d. ,,
Chloral hydrate 50 kg. 10s. kg.
Citric acid, B.P. Powder or granulated:
1-cwt. lots £11 5s. cwt.
5-cwt. lots £11 ,,
Codeine
Alkaloid 100 g. £138 10s. kg.
Phosphate 100 g. £110 ,,
Cream of tartar
1-cwt. lots £12 5s. cwt.
5-cwt. lots £12 3s. ,,
Ephedrine
Hydrochloride 3 kg. £7 1s. 1d. kg.
Alkaloid 3 kg. £12 7s. kg.
Sulphate 3 kg. £7 1s. 1d. ,,
Eucalyptol
1-cwt. lots 11s. lb.
5-cwt. lots 10s. 6d. ,,
Ferri ammonium citrate B.P.
1-cwt. lots, scales 4s. 7d. lb.
1-cwt. lots, granules 3s. 9d. ,,
Ferrous gluconate
1-cwt. lots dlvd. 6s. 3d. lb.
Gallic acid B.P.C.
1-cwt. lots 10s. ,,
Gluconic acid technical 50%
Minimum 12-gal drums
19s. gal., drums extra, returnable
Glucono delta lactone
1-ton lots delvd. 5s. net lb.
Glycerophosphoric acid
24 litres 11s. 10d. litre
Glycine (amino acetic acid)
12½ kg. 18s. 10d. kg.
Hexyl resorcinol 10 kg. £7 10s. kg.
Hydroquinone 12½ kg. 23s. 10d. kg.
Iodides
Ethyl 4 kg. bottles 62s. 9d. kg.
Mercury, red B.P.C.
12½ kg. lots 49s. 6d. ,,
Potassium B.P.
12½ kg. lots 15s. 0d. ,,
Sodium B.P.
12½ kg. lots 21s. 6d. ,,
Iodine, Chilean crude,
99% min. in wooden casks 15s. kg.
Iodoform
12½ kg. and under 50 kg. 42s. 6d. kg.
Lactose 50 kg. 3s. 2d. kg.
Lithium salts 5-cwt. lots
Benzoate 10s. lb.
Carbonate B.P.C. 11s. 3d. ,,
Chloride (commercial) powder 11s. ,,
,, granular 10s. 9d. ,,
Hydroxide 9s. 9d. ,,
Citrate B.P.C. 9s. ,,
Sulphate 8s. 6d. ,,
Salicylate, 10 cwt., dlvd. 9s. 9d. ,,
Magnesium carbonate B.P.
Light cwt. lots dlvd. £129 ton
Magnesium trisilicate 28-lb. packs
28-lb. lots 4s. 3d. lb.
1-cwt. lots 3s. 10d. ,,
5-cwt. lots 3s. 7d. ,,
Bulk rates for larger quantities are from 3s. 1d. lb. in 1-ton lots
Manganese hypophosphite B.P.C.
7-lb. lots 13s. 11d. lb.
1-cwt. lots 12s. 11d. ,,
Mercuric chloride B.P.
50-kg. lump 48s. 6d. kg.
Methyl salicylate 1-cwt. lots 3s. 3d. lb.
Morphine
Alkaloid, 100 g. £138 18s. 4d. kg.
Nicotinamide 1 kg. £3 kg.
Nicotinic acid
12½ kg. 33s. 9d. kg.
1 kg. 36s. ,,
Oleine, B.P. extra pale, 3/4 cwt. drums returnable carriage paid G.B. £160 ton
Phenolphthalein 50 kg. 24s. 3d. kg.
Phosphoric acid B.P.
(s.g. 1·750) 10-carboy lots 1s. 4d. lb.
Potassium permanganate B.P.
1-cwt. lots dlvd. 1s. 11¼d. lb.
Procaine hydrochloride (foreign) 2 kg. 59s. kg.
Quinine 1-oz. lots 4s. 4d. oz.
Riboflavin
100 g. 5¼d. g.
10 g. 7d. ,,
Saccharin
500 g. £7 4s. for this quantity
Salicylic acid
B.P., dlvd. 3s. 2¼d. to 5s. 6d. lb.
Silver nitrate
500 g. 5s. 1¼d. oz.
Sodium benzoate B.P.
1-cwt. lots 2s. 9½d. lb.
1-ton lots 2s. 7½d. ,,
Sodium gluconate technical
3-cwt. lots delvd. 3s. net lb.
Sodium salicylate
50 kg. 8s. 8d. kg.
12½ kg. 9s. ,,
Sodium thiosulphate
Crystals, photographic quality
1-ton lots 49s. cwt.
Stearic acid B.P.C. flake, carriage paid G.B. £154 ton
Strychnine 25 oz.
Alkaloid 8s. oz.
Hydrochloride 8s. ,,
Sulphate 7s. ,,
Sulphaguanidine
12½ kg. 33s. kg.
50 kg. 32s. ,,
Sulphanilamide
12½ kg. 16s. 6d. kg.
50 kg. 15s. 4d. ,,
Sulphathiazole 12½ kg. 39s. 9d. kg.
Tannic acid B.P. Levis
1-cwt. lots 10s. lb.
Tartaric acid B.P.
Powder or granulated,
10 cwt. or more £15 cwt.
Terpineol B.P.
40-gal. drums 2s. 4½d. lb.
1-cwt. lots 2s. 7d. ,,
Theophylline B.P.
500 g. 27s. 6d. for this quantity
Thiamine hydrochloride
100 g. 4d. g.
1 kg. £11 15s. kg.
Thioglycollate
Ammonium 12s. 4d. to 16s. 4d. lb.
Calcium:
7-lb. lots 17s. 3d. ,,
5-cwt. lots 14s. 3d. ,,
α-Tocopherol 25-g. lots 1s. g.
Vanillin 23s. 6d. to 30s. 6d. lb.
Zinc oxide B.P.
2-ton lots £116 ton

GENERAL CHEMICALS

Acetic acid 1-ton lots dlvd.
80% Technical £99 ton
80% Pure £105 ,,
Glacial B.P. £114 ,,
99-100% Glacial £111 ,,
98-100% Glacial £108 ,,

Acetic anhydride
1-ton lots dlvd. £128 ton
Acetone
5-gal. drums, free, non-returnable £128 ton
40 to 45-gal. drums, 10-ton lots £88 „
Alum, potassium granular crystals
50 kg. 1s. 2d. kg.
Aluminium hydroxide B.P.C. 34
28-lb. lots 2s. 4d. lb.
Aluminium stearate
(Precipitate) 1-ton lots £258 6s. ton
Ammonia
Persulphate £6 2s. 6d. cwt.
Phosphate: Mono- £106 ton
Di- £100 „
Amyl acetate
B.S.S. 10 tons and over £251 ton
Technical £249 „
Amyl alcohol
Technical in 1-ton lots £256 ton
Arsenic White powdered ex store £42 ton
n-Butyl acetate
10-ton lots £173 ton
n-Butyl alcohol
10-ton lots £149 ton
Calcium chloride
Solid 70 to 72%, 8-ton lots dlvd. £16 10s. ton
Calcium oxide (Lime)
Ex marble 28-lb. lots 3s. 10d. lb.
Caustic soda
Solid 1-ton lots, from £37 16s. 6d. ton
Chloroform B.P. ½-ton lots 2s. 11½d. lb.
Chromic acid
Dlvd. U.K. (less 2½%) 2s. 0¼d. to 2s. 0¾d. lb.
DDT 3s. 0½d. to 3s. 2d. lb.
2 : 4-Dichlorophenoxyacetic acid
99% pure, 1-cwt. bags £320 ton
Dimethyl sulphate 440 lb. drum lots 3s. 8d. lb.
Ether (Diethyl ether)
Tech. B.S.S. and Solvent B.P. 1-ton lots in drums 2s. lb.
Ethyl acetate 10-ton lots £145 ton
Ethyl alcohol
95% Gay Lussac 66·0 o.p.
2,500 to over 300,000 proof gallons per year in tank wagons
4s. 2¾d. to 4s. 0¼d. per proof gal.
Ferrous sulphate 50 kg. 1s. 4d. kg.
Formaldehyde
40% by volume dlvd. England 1-ton lots £38 15s. ton
Glycerin
1·2627 s.g. chem. pure, 5 tons and up, 5-cwt. drums £201 10s. ton
1·2627 s.g. technical grade, 5 tons and up, 5-cwt. drums £196 10s. ton
Hexamine
1-ton lots
Technical, bulk 1s. 8d. lb.
B.P.C. 1s. 11d. „
Hydrochloric acid
Commercial 18s. 6d. cwt.
Hydrogen peroxide
27·5% weight £119 ton
35% weight £143 „
Lactic acid (1-ton lots)
Pale tech. 44% by weight 1s. 3¼d. lb.
Dark tech. 44% by weight 9¼d. lb.
Magnesium chloride
Solid (ex wharf): 1-ton lots £17 10s. ton
Magnesium sulphate £15 ton
Mercurous chloride (calomel)
50 kg. 65s. kg.
Mercury sulphide, red
Ton lots and over 30s. 6d. lb.
Methylated spirits (Industrial)
Perfumery quality 500 gal. and upwards: gal.
61 o.p. 7s. 2½d.
74 o.p. 7s. 10d.
5 to 10 gal.:
61 o.p. 8s. 8d.
74 o.p. 9s. 3½d.
Methyl ethyl ketone
10 tons dlvd. in drums £143 ton
Methyl isobutyl carbinol
10 tons and up, in drums, dlvd. £163 ton
Methyl isobutyl ketone
10 to 50 tons, in drums, dlvd. £169 ton
Naphthalene
Crystal, dlvd., 4-ton lots, spot £78 15s. ton
Ball and flake (ditto) £86 15s. „
Nickel sulphate
dlvd. ton lots £189 ton
Nitric acid 70% intermediate £32 „
Pentachlorphenol
Flake, technical, 1-ton lots, dlvd. 2s. 2d. lb.
Phenol Crystals:
Under 1 ton dlvd. from 1s. 7d. lb.
10 tons and over dlvd. in returnable drums from 1s. 4½d. lb.
Phthalates
10-ton lots in drums
Diethyl (B.S.) £187 10s. ton
Dimethyl (B.S.) £179 ton
Potassium bromide
50 kg. 5s. 6d. kg.
12½ kg. 5s. 8d. „
Potassium carbonate
Calcined 96 to 98% (1-ton lots ex store) £76 ton
Hydrated (1-ton lots) £74 10s. „
Potassium fluoride
28-lb. lots 5s. 1d. lb.
Potassium sodium tartrate
5-cwt. lots £10 cwt.
Soda ash
1-ton lots dlvd., from £19 16s. 6d.
Sodium cyanide
96-98% £130 ton
Sodium hydroxide 28-lb. lots:
sticks (1-lb. bottles) 4s. 3d. lb.
pellets „ „ 3s. 9d. „
Sodium metal 28-lb. lots 3s. 8d. „
Sodium metasilicate
Dlvd. U.K. in ton lots £26 ton
Sodium phosphate
Dlvd. ton lots: Di-sodium, crystalline £40 10s. ton
Anhydrous £88 „
Tri-sodium, crystalline £39 „
Anhydrous £86 „
Sodium silicate
according to quantity, grade and delivery point
8-ton lots £13 10s. ton
1-ton lots £17 „
Sodium sulphate Ex works:
(Glauber salt) £13 ton
(Salt cake) unground, full truck loads £8 16s. 6d. ton
Sodium sulphide
Broken, returnable drums, dlvd. ton lots £37 2s. 6d. ton
Flake, ditto £38 12s. 6d. „
Solid ditto £36 2s. 6d. „
Sodium sulphite
Commercial crystals 4-ton lots £24 10s. „
(Dlvd. London in 1-cwt. single non-returnable bags)
Sodium tripolyphosphate
1-ton lots £95 ton
Stannic chloride 28-lb. lots 8s. 11d. lb.
Stannous chloride 28-lb. lots 9s. 5d. lb.
Strontium carbonate
96-98% 28-lb. lots 3s. lb.
Sulphuric acid, ex-works, according to quality and quantity
B.O.V. 78% from 8s. to 10s. cwt.
C.O.V. 96% from 11s. to 14s. cwt.
Zinc chloride
28-lb. lots sticks 6s. 9d. lb.

OILS AND FATS

Palm kernel oil
Refined, deodorised, 2-ton lots, naked, ex works £150 ton
Palm oil
Refined, deodorised, 2-ton lots, naked, ex works £104 ton
Stearine
dlvd. free bags
Pristerene 64 flake £148 ton
Pristerene 62 flake £133 „
Pristerene 61 flake £113 „
A premium of £2 ton is charged for powder and £4 for block

GUMS AND WAXES

Agar Agar No. 1
Kobe strip 15s. lb.
Powder £1 „
Beeswax
Dar-es-Salaam spot (nominal) £26 cwt.
Sudan spot (duty paid) £24 5s. „
Bleached white (slab) £30 „
Refined yellow (slab) £26 10s. „
Benzoin
Sumatra spot £26 10s. cwt.
Siam spot £2 7s. 6d. lb.
Candelilla Spot £23 cwt.
Carnauba
Prime, Spot £47 cwt.
Fatty grey £31 „
Gum arabic Lump £9 15s. cwt.
Karaya Powder, Spot 3s. 8d. lb.
Paraffin wax
1-ton lots, acc. to grade £87 10s. to £120 ton
Peru balsam 13s. 6d. lb.
Shellac
No. 1 orange £13 10s. cwt.
No. 2 orange £11 10s. „
Transparent white 4s. 3d. lb.
Pale dewaxed 6s. „
Tragacanth
No. 1 spot £127 cwt.
No. 2 spot £121 „
Pale leaf £51 „
Amber £38 „
Brown to Red £27 „

New Products

Anti-hypertensive agent

Darenthin (bretylium tosylate), for the treatment of hypertension is now generally available from Burroughs Wellcome and Co. It is issued as 200 mg. compression coated tablets in bottles of 100, net price 37s., and 500, net price 175s.

Insecticidal paints

A new range of paints containing insecticides is available from the Leyland Paint and Varnish Co. Ltd. Marketed under the name *I-Gene*, the coatings may be used in temperate, semi-tropical and tropical climates and can be applied in the same way as normal paints.

The insecticides which are incorporated into the coating are Shell Chemical Co.'s *Aldrin* and *Dieldrin*. They are said to be retained in the coating indefinitely and are released on to the surface of the coating as a "bloom" of crystalline insecticide. This "bloom" can be temporarily removed or distributed by severe cleaning, but renews itself on the paint surface within a few hours.

The new paints are designed to kill most types of insects such as houseflies, bluebottles, ants, earwigs, silverfish, clothes moths, beetles, cockroaches and weevils. The clear lacquer in the range may be used on plain woodwork to give protection against woodworm or termites.

According to the manufacturers surfaces painted with the new coatings are effective for a minimum of two years, even in severe conditions. The paints are non-poisonous to human beings.

Silicone antifoam

A new silicone antifoam of exceptional promise — DP.44 — has been added to the I.C.I. development range. In emulsion form, DP.44 is readily dispersed even in cold water, a property which, coupled with low viscosity, gives both improved defoaming and antifoaming action. Difficulties in the preparation of working dilutions are eliminated and the product is very easily handled during manufacturing processes.

DP.44 is recommended for all types of aqueous systems except in the processing of foodstuffs, where it is not recommended because it contains a bactericide. The product is effective in dilutions of from one to 50 p.p.m. of foamer. With its use, process and product efficiencies are increased and the effective capacities of stills, kettles and other equipment can be increased by 30 to 50%.

In many processes, including distillations, where inflammable foam may build up, the presence of DP.44 as inhibitor or suppressor will minimise the danger of fire and cut down process time by permitting continuous heating.

Already, DP.44 has proved its advantages in adhesives manufacture, pulp and paper manufacture and coating, textile finishing, latex processing and handling, leather finishing, fermentation processes and metal reclaiming.

DP.44 is designed primarily for aqueous systems, but it is highly effective in some non-aqueous systems. In such systems, however, its performance would be evaluated against that of the I.C.I. fluids M.430 and F.110 which are designed specifically for non-aqueous systems.

Potent corticosteroid

Millicorten, made by Ciba Laboratories Ltd., is a synthetic derivative of prednisolone, claimed to have a more potent anti-inflammatory effect, together with relatively few side-effects when used in therapeutic dosage. Chemically the product is 16α-methyl-9αfluoroprednisolone and has the generic name dexamethasone.

Advantages claimed for it are fewer side effects, less sodium retention and potassium excretion, no effect on blood pressure, and less risk of diabetogenic effects. In rheumatoid arthritis it is stated that a dose of up to 4 mg. of *Millicorten* daily will usually relieve both local and general symptoms within a few days; other applications are in rheumatic fever, skin disorders, bronchial asthma, malignant tumours, etc.

Millicorten is available in scored tablets of 0·5 and 1 mg. Retail prices for packs of 25 are 30s. and 57s. respectively.

Controlling botrytis

A new product, marketed by Boots under the trade name of *Allisan*, combats "grey mould" or botrytis, the principal fungus disease of glass raised lettuce. It is claimed that for the first time this disease can now be controlled without checking the growth of the plant. The product contains a nitrated chloro-aniline derivative and is sold in the form of a yellow powder which is mixed with the soil before planting or used afterwards as a dust. The powder is completely odourless, taintless and non-toxic.

Allisan has also proved effective, under glass, against "tulip fire," a botrytis species that reduces tulip blooms to brown tissue. Work is continuing on control of tulip fire in the field. The product is also a control for stem botrytis in tomatoes.

A 7 lb. tin costs 22s. and will treat 100 sq. yd. of lettuce. The effects last roughly the life of the average glasshouse or frame winter lettuce crop.

Cosmetic creams

A range of beauty creams and lotions and reducing creams based on royal jelly, placenta extracts and vitamins is available from Manners Italiana (G.B.) Ltd. The manufacturers claim the products help rejuvenate the skin and reduce unwanted weight.

Ready-prepared penicillin

The Distillers Co. (Biochemicals) Ltd. has introduced *Distaquaine V-K Suspension*. This is not presented in granule or powder form for reconstitution before use but is ready-prepared and is claimed to be the first product of its kind. It is available in bottles of 60 ml. (approximately 2 fl. oz.) containing in each 5 ml. teaspoonful 125 mg. penicillin V as potassium salt.

Retail price, 13s. 3d. per bottle; trade price, 8s. 10d. per bottle.

Oral diuretic and hypotensive

An oral diuretic, flumethiazide, for the treatment of all conditions requiring increased diuresis or relief of œdema as well as for the relief of hypertension, has been synthesised by the Squibb International Division of Olin Mathieson Chemical Corp. Sold under the name *Ademil*, flumethiazide has been used alone or in combination with whole root Rauwolfia serpentina whose antihypertensive action it potentiates. The combined product is called *Rautrax*. Chemically it is 6-(trifluoromethyl)-1,2,4 - benzothiadiazine - 7-sulphonamide, 1,1-dioxide.

Ademil is supplied as coated tablets containing 250 mg. or 500 mg. of flumethiazide. *Rautrax* is available in capsule-shaped tablets containing 400 mg. flumethiazide, 50 mg. whole root Rauwolfia serpentina, and 400 mg. potassium chloride.

Long-acting anticholinergic

An anticholinergic agent which is claimed to give uninterrupted, 24 hr. effect with only one dose every 12 hr., to have effective anti-secretory and anti-spasmodic activity and to be free from troublesome side-effects, is available from Smith Kline and French Laboratories Ltd. Named *Tyrimide*, the product is (3-carbamoyl-3, 3-diphenylpropyl) methyldiisopropyl ammonium iodide and, according to the manufacturers, because of its inherent prolonged action, need be taken only twice daily, the normal dose being one 5 mg. tablet every 12 hr., although severe cases may require three 5 mg. tablets in a 24-hr. period followed by a lower maintenance dose.

Tyrimide is available in containers of 30 5-mg. tablets; trade price is 92s. 6d. per doz. with purchase tax of 23s. 1½d.; the retail price is 13s. 6d. each. Packs of 250 tablets are also available.

NEW PATENTS

COMPLETE SPECIFICATIONS ACCEPTED

Pharmaceuticals

Phenthiazine derivatives and processes for their preparation. *Soc. Des Usines Chimiques Rhône-boulenc.* 819,886; 819,852.

Production of vaccines. *University Court of the University of Glasgow.* 819,830.

Process for the production of peptides. *UCLAF.* 820789.

Quaternary ammonium salts of dialkylaminoalkyl thiophosphate esters. *Campbell Pharmaceuticals Inc.* 819,735.

Preparation of cyclopentanopolyhydrophenanthrene compounds. *Merck and Co. Inc.* 819,650.

Sulphonamides. *Smith and Nephew Ltd.* 819,280.

Quinone derivatives and a process for their preparation. *National Research Development Corp.* 819,654.

Therapeutic compositions. *Geigy A.G.* 820,196.

Ethyl bis (2-chloropropyl) carbamate and the preparation thereof. *Wellcome Foundation Ltd.* 819,186.

Sodium salts of phosphoric esters of lactose. *Farmaceutici Italia S..A.* 819,359.

Production of diaminopimelic acid by a fermentation process. *Pfizer and Co. Inc.* 820,267.

Process for preparing vaccines for preventing and combating malign tumours. *B. Joos.* 821,921.

Analgesically active substituted alpha, alpha-diphenyl-γ-aminobutyramides and the manufacture thereof. *Nederlandsche Combinatie Voor Chemische Industrie N.V. and Laboratoria Pharmaceutica Dr. C. Janssen N.V.* 822,055.

Reserpine derivatives and the manufacture thereof. *Upjohn Co.* 821,280.

Esters of 2 : 3-dimercaptopropanol. *Beecham Research Laboratories Ltd.* 820,954

Pharmaceutical compositions. *Imperial Chemical Industries Ltd.* 821,077.

Derivatives of salicylic acid. *Keystone Chemurgic Corp.* 820,439.

Process for the production of an antitumour substance raromycin. *Y. Sumiki, and H. Umezawa.* 822,226.

Process for the preparation of alpha-phenoxyalkanoic acids. *Boots Pure Drug Co. Ltd.* 822,199.

Preparation of unsaturated compounds of the cyclopentanopolyhydrophenanthrene series. *Organon Laboratories Ltd.* 820,539.

Pharmaceutical compositions comprising benactyzine and meprobamate. *Carter Products Inc.* 821,500.

Production of N.-substituted 2-hydroxymethyl pyrrolidines. *Beecham Research Laboratories Ltd.* 820,503.

α-mercapto-amides and a process for the manufacture thereof. *Hoffmann-la Roche and Co., A.G.* 819,199.

Antibiotics

Production of cephalosporin by fermentation. *Imperial Chemical Industries Ltd.* 820,423.

Streptomycin and dihydrostreptomycin compounds. *Lepetit S. p. A.* 822,081.

Antibiotic compositions containing antibiotic E129 factors. *Glaxo Laboratories Ltd.* 820,658.

Salt of phenoxymethyl-penicillin and its use for the isolation of said penicillin. *K. Abildgaard.* 820,535.

Antibiotic composition. *Merck and Co. Inc.* 819,652.

Production of an antibiotic designated novobiocin. *Merck and Co. Inc.* 821,819.

Isolation and purification of the antibiotic novobiocin. *Merck and Co. Inc.* 821,820.

Antibiotics P.A. 114A and P.A. 114B. *Pfizer and Co. Inc.* 819,872.

Detergents

Washing compositions. *Meyer Manufacturing Co.* 819,837.

Preparation of detergent compositions. *Hedley and Co. Ltd.* 819,183;820,340.

Herbicides, fungicides, etc.

Substituted phenyl urea herbicidal compositions. *Du Pont de Nemours and Co.* 821,104.

Method of making a fungicidal substance. *United States Rubber Co.* 819,779.

Chlorinated and brominated polycyclic hydrocarbons, their preparation, and insecticidal compositions containing them. *Shell Research Ltd.* 819,240.

Substituted urea herbicides. *Farbenfabriken Bayer A.G.* 819,853.

Fungicidal compositions. *Armour and Co.* 820,598.

Compositions for destroying and/or inhibiting weed growth. *Heyden Newport Chemical corp.* 821,533.

Triazine derivatives and herbicidal compositions containing them. *Du Pont de Nemours and Co.* 819,520.

Substituted phenyl ureas and herbicidal compositions. *Du Pont de Nemours and Co.* 821,103.

Herbicidal agents. *Boots Pure Drug Co. Ltd.* 820,156.

Salts of alpha-(4-chloro-2-methylphenoxy)-propionic acid and herbicidal compositions containing them. *Boots Pure Drug Co. Ltd.* 820,180.

Herbicidal compositions. *Fisons Pest Control Ltd.* 821,039.

Steroids

18-oxygenated steroids. *T. Reichstein.* 821,778;821,779.

Urinary estrogen compositions and methods for preparing them. *Ayerst, McKenna and Harrison Ltd.* 821,989.

Oxygenated steroids and process for their manufacture. *T. Reichstein.* 821,777.

Process for the production of -estradiol. *Laboratoires Français de Chimiotherapie.* 822,205.

Isolation of a ketosteroid from lantana camara linn. *Council of Scientific and Industrial Research.* 820,521.

Therapeutic compositions containing steroid and antibiotic. *Upjohn Co.* 819,793; 819,794.

Steroids and the manufacture thereof. *Upjohn Co.* 822,118.

Dyestuffs

Water-insoluble monoazo dyestuffs. *Sandoz Ltd.* 819,664

Disazo-dyestuffs and process for their manufacture. *Ciba Ltd.* 821,029.

Metallizable monoazo dyestuffs of the benzene-azo-pyrazolone series, complex metal compounds thereof, and their use. *Geigy A.G.* 819,314.

Dyestuffs of the anthraquinone series. *Farbenfabriken Bayer A.G.* 819,956.

Copper-containing disazo dyestuffs. *Farbenfabriken Bayer A.G.* 819,841.

1, 2-metal complexes of monoazo dyestuffs of the benzene-azo-pyrazolone series. *Farbenfabriken Bayer A.G.* 819,174.

Copper-containing polyazo dyestuffs. *Farbenfabriken Bayer A.G.* 820,472.

Metalliferous mono-azo dyestuffs of the benzene azo-naphthalene series. *Sandoz Ltd.* 820,158.

Water-insoluble chromiferous dyestuffs and process for their manufacture. *Ciba Ltd.* 820,626.

Disazo-dyestuffs of the stilbene series complex metal compounds thereof and process for making them. *Ciba Ltd.* 820,950.

Metallizable monozao dyestuffs, complex heavy metal compounds thereof, and their use. *Geigy, A.G.* 820,502.

Mixed chromium complexes of monoazo dyestuffs and process for their manufacture. *Ciba Ltd.* 820,489.

Copper complexes of trisazo dyestuffs. *Cassella Farbwerke Mainkur A.G.* 820,990

Sulphur dyestuffs of the dioxazine series. *Cassella Farbwerke Mainkur A.G.* 815,840.

Water-insoluble monoazo dyestuffs of the benzene-azo-benzene series. *Sandoz Ltd.* 816,308.

Compositions comprising normally water insoluble dyestuffs and dextran derivatives. *Commonwealth Engineering Co.* 818,750.

Process for the production of sulphur dyestuffs of the phthalocyanine series. *Cassella Farbwerke Mainkur A.G.* 816,656; 816,657.

Metal containing polyazo dyestuffs. *Farbenfabriken Bayer A.G.* 818,008.

Copperable disazo dyestuffs derived from 5-aminopyrazols. *Farbenfabriken Bayer A.G.* 814,273.

Agricultural chemicals

Herbicide composition containing 2,2-dichlorobutyric acid or salts thereof. *Dow Chemical Co.* 815,200.

Thiophosphoric acid esters and their use in the control of pests. *Ciba Ltd.* 814,198.

Dithiophosphate ester and insecticidal compositions comprising it. *Sandoz Ltd.* 814,587.

N-nitroso-hydroxylamines and fungicidal agents. *Badische Anilin- and Soda-Fabrik A.G.* 815,538.

Fungicidal compositions. *Armour and Co.* 815,827.

Methylmercuric pentachlorophenolate, the preparation thereof and fungicidal compositions containing same. *Aagrunol, Chemische Fabriek N.V.* 819,130.

Bacteriocidal hexamine compound. *Farbenfabriken Bayer A.G.* 815,770.

Polymeric bisthiuram disulphides and fungicides derived therefrom. *United States Rubber Co.* 816,341.

Sulphonyl ethylene fungicides. *Pittsburgh Coke and Chemical Co.* 819,069.

Phytotoxical and insecticidal preparations and compounds. *Philips Gloeilampenfabrieken N.V.* 818,437.

Fungicidal compositions and materials. *Monsanto Chemicals Ltd.* 818,114.

Insecticidal compositions. *Shell Research Ltd.* 815,511.

Pesticidal basic esters of phosphorus-containing acids. *Imperial Chemical Industries Ltd.* 814,264.

Herbicidal amine salts of chlorobenzoic acids. *Amchem Products Inc., formerly American Chemical Paint Co.* 819,127.

Composition for the control of undesired vegetation. *Dow Chemical Co.* 815,210.

Compositions for combating nematodes. *Farbenfabriken Bayer A.G.* 814,687.

NEW TRADE MARKS

APPLICATIONS

Cosmetics and toilet preparations

VINTAGE.—783,004. *Vintage Cosmetics.*

DANDRICIDE.—787,684. *King Research Inc.*

HOLIDAY.—B784,714. *Bourjois Ltd.*

SUNPINE.—785,709. *Promedico Products Ltd.*

SARDO.—B786,303. *Sardeau Inc.*

VIA.—786,531. *Lever Bros., Port Sunlight Ltd.*

PASCALIN.—*C. H. Boehringer Sohn.*

BRUMAIRE.—787,947. *Marcel Franck and Co. (London) Ltd.*

ROMOCOLOR.—782,537. *Charles Bedeman Ltd.*

BRISTOW'S STAR SPRAY.—784,816. *T. F. Bristow and Co.*

GYE.—B785,388. *J. R. Geigy S.A.*

SWEET LASS OF RICHMOND HILL.—786,500. *D. A. Lyster.*

TRIDERMA.—B786,764. *C. H. Boehringer Sohn.*

HEGOR.—788,711. *Mila.*

Pharmaceuticals

CONFIDENTIAL.—B777,326. *Imperial Chemical Industries Ltd.*

HANDASED.—777,538. *Handag.*

BANOLINE.—780,477. *D.D.D. Co. Ltd.*

TELOTREX.—780,600. *Bristol Laboratories Inc.*

TIGUVON.—780,647. *Farbenfabriken Bayer A.G.*

BESONITRON.—783,768. *C. H. Boehringer Sohn.*

SAFFEDYS.—785,009. *Glaxo Laboratories Ltd.*

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NEW COMPANIES

These particulars of new companies have been extracted from the daily register of Jordan and Sons Ltd., company registration agents, Chancery Lane London, W.C.2.

Marshall Robinson Ltd. 28.7.1959. 55 Parliament Rd., Middlesbrough. Chemists £100. Dirs.: M. and Mrs. L. Robinson.

H. Nichols and Co. (Chemicals) Ltd. 29.7.59. 71 Barton Rd., Worsley, nr. Manchester. £2,000. Dir.: H. Nicholls.

J. Busby (Wheathampstead) Ltd. 31.7.59. 2 High St., Wheathampstead. Chemists. £2,000. Dir.: J. S. Mills.

Poons and Lengsfelder Ltd. 31.7.59. 62 Brook St., London, W.1. Manfrs. of and dlrs. in aromatic, natural and chemical products for soap, detergent, perfumery and cosmetic industry. £1,000. Dir.: J. A. King.

Bellefax Ltd. 4.8.59. Mnfrs. of and dlrs. in cosmetic and toilet products. £1,000. Sub.: D. M. Dixon, 4 Arundel St., London, W.C.2.

Astrem Ltd. 5.8.59. 3. Abchurch Yard, London, E.C.4. Chemists. £100. Dir.: F. and I. Silten.

John Asker Ltd. 5.8.59. 303 Stratford Rd., Birmingham 3. Chemists. £100. Dir.: J. R. Asker.

M. A. Gordon (Chemists) Ltd. 5.8.59. 12B Cricklewood Lane, London, N. W.2. To take over bus. of "Maxwell-Gordon Chemists," etc. £5,000. Dir.: M. A. Gordon.

Technicon Chemicals Ltd. 7.8.59. 115 Leadenhall St., London, E.C.3. £100. Sub.: I. F. Shaw.

Vectron Electro-Physics Ltd. 15.6.59. Spur Rd., North Feltham Trading Estate, Bedfont, Midx. Chemical engrs., etc. £50,000. Sub.: P. Goodbody.

F. C. Collins Ltd. 15.6.59. 29-30 Bedford Row, London, W.C.1. Chemists. £1,000. Dir.: F. C. Collins.

Arnwest Chemicals Ltd. 16.6.59. 544 Ashton New Rd., Clayton, Manchester. £8,000. Dir.: T. A. Wilson.

W. H. Chadwick (Chemists) Ltd. 7.6.59 48 Windmill St., Gravesend. £100. Dir.: W. H. Chadwick.

New patents and patent abstracts are from the *Journal of Patents*, and new trade marks are from the *Trade Marks Journal*. In each case permission to publish has been given by the controller of Her Majesty's Stationery Office. Each of the publications mentioned is obtainable from the Patent Office, 26 Southampton Buildings, London, W.C.2.

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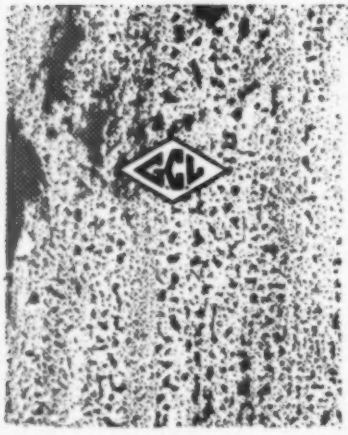

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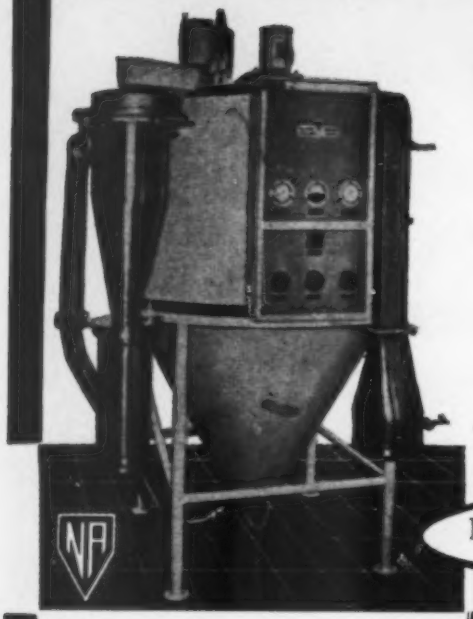

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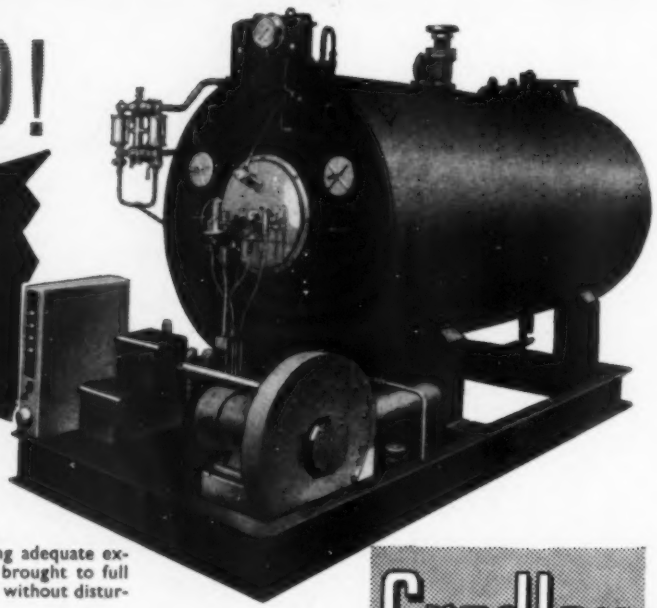

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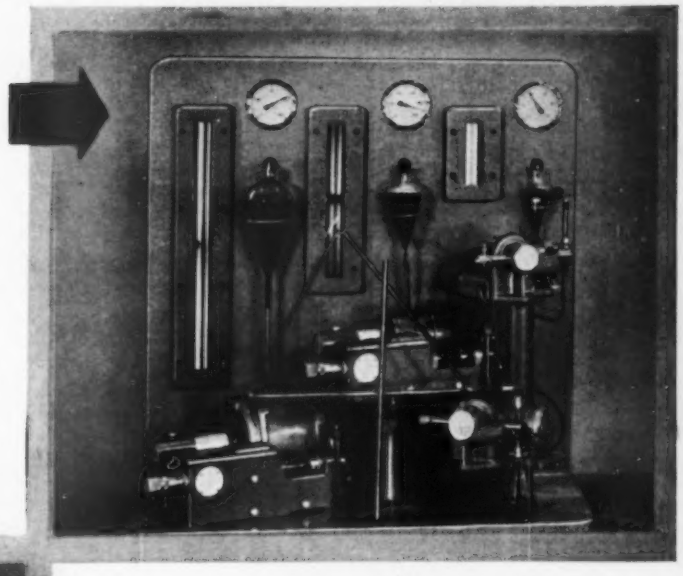

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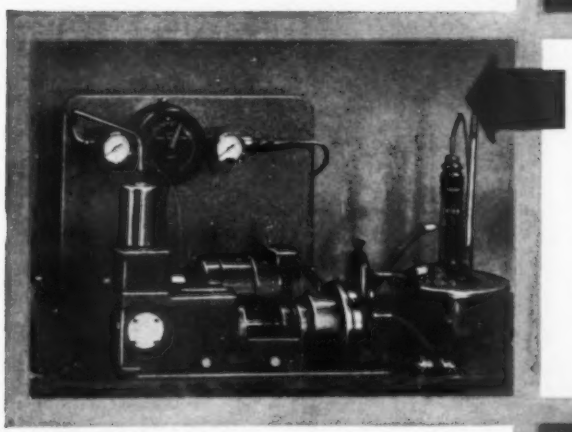

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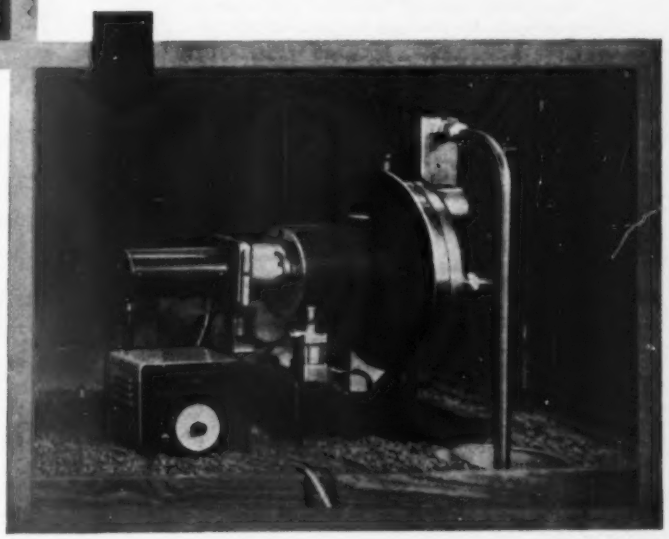

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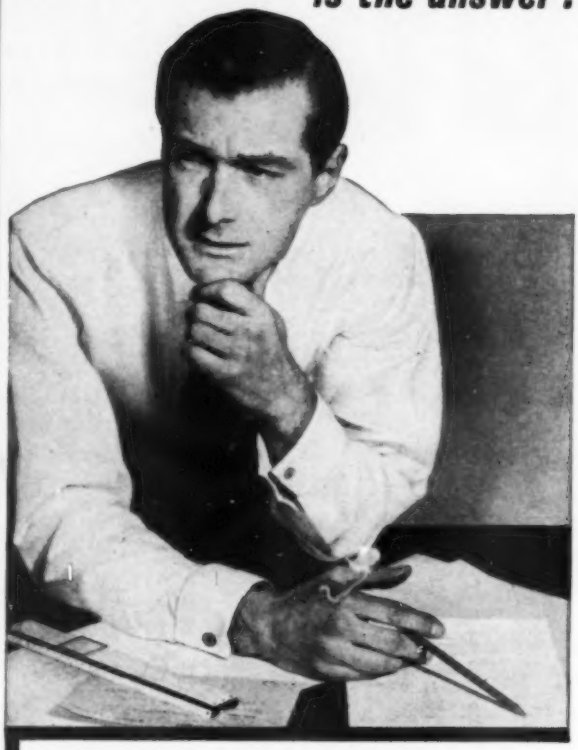

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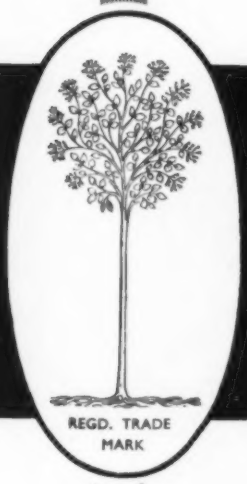

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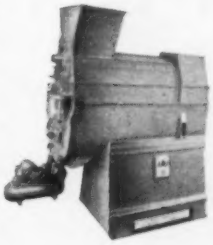

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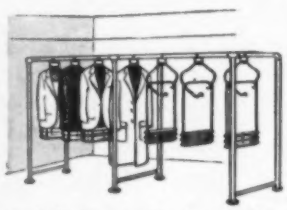

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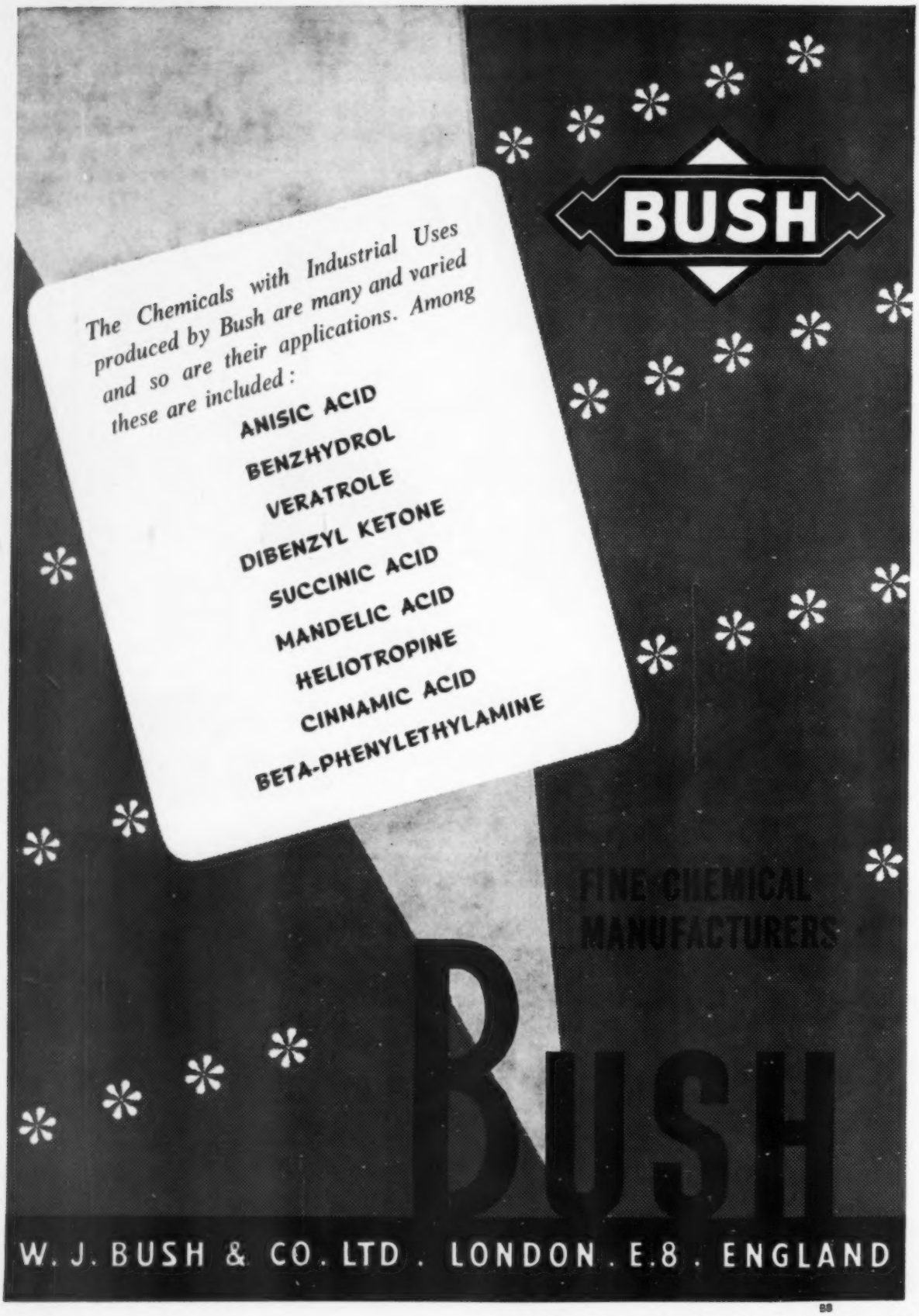
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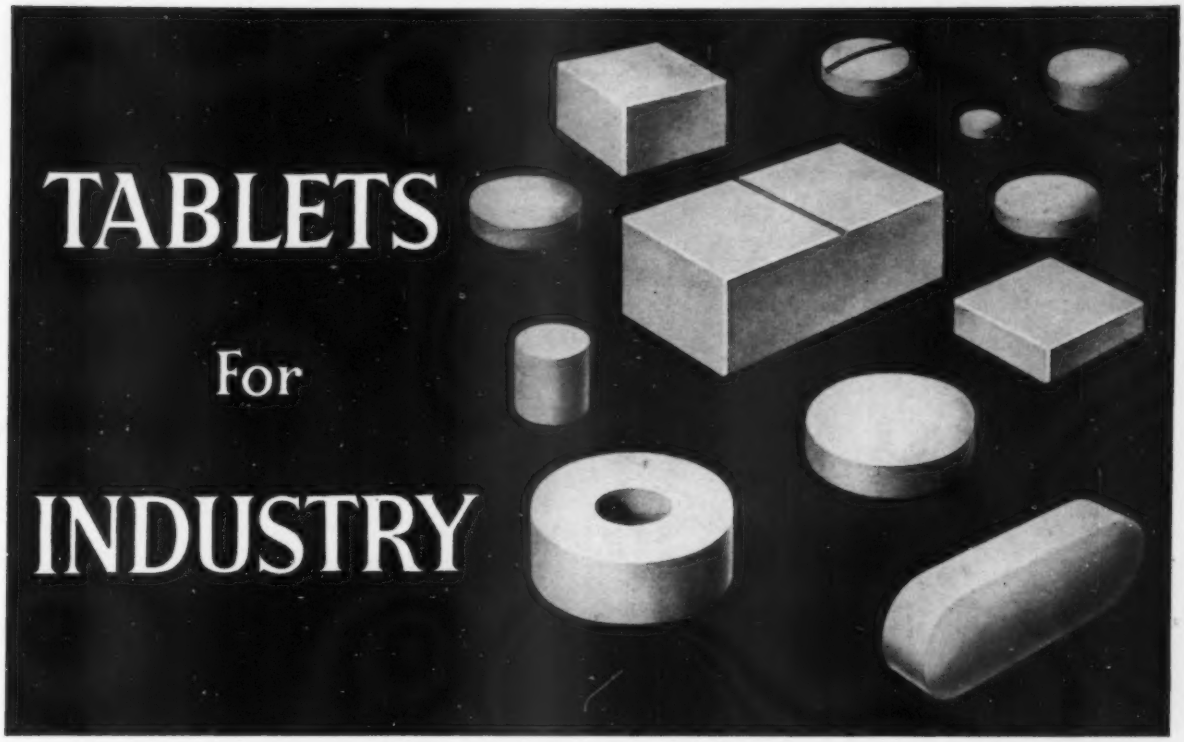

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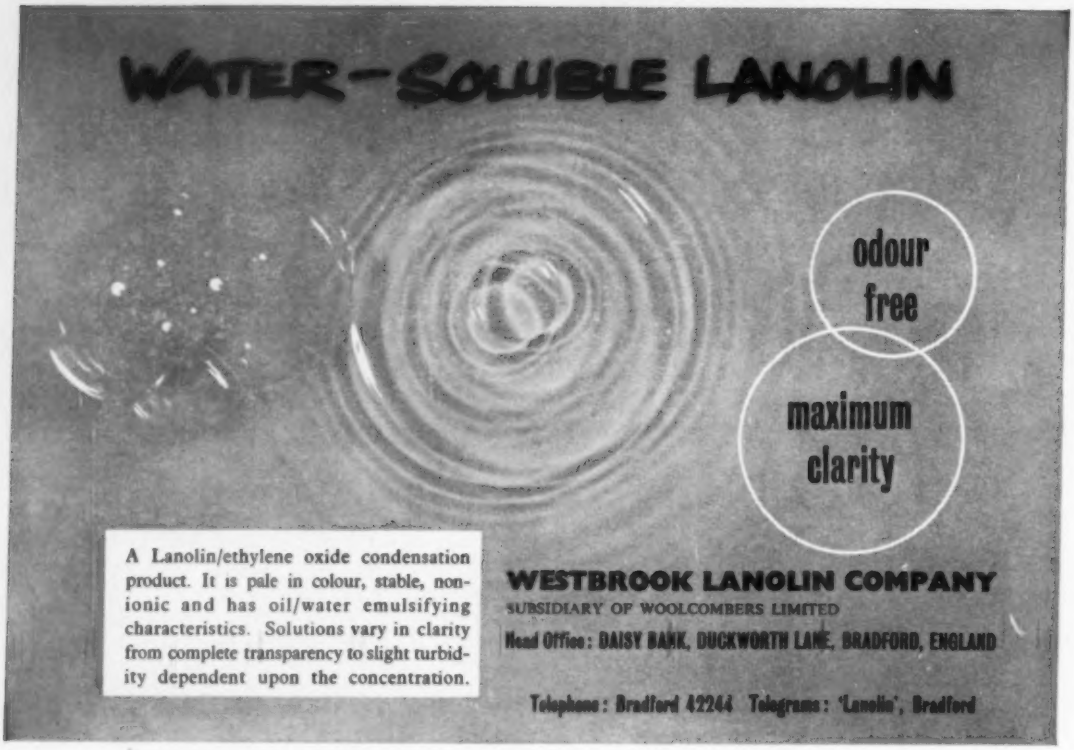

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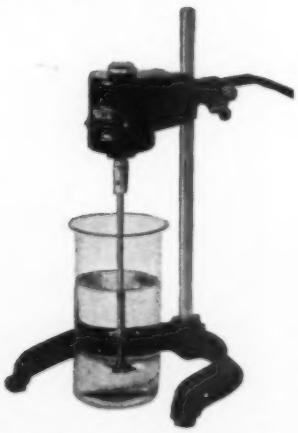

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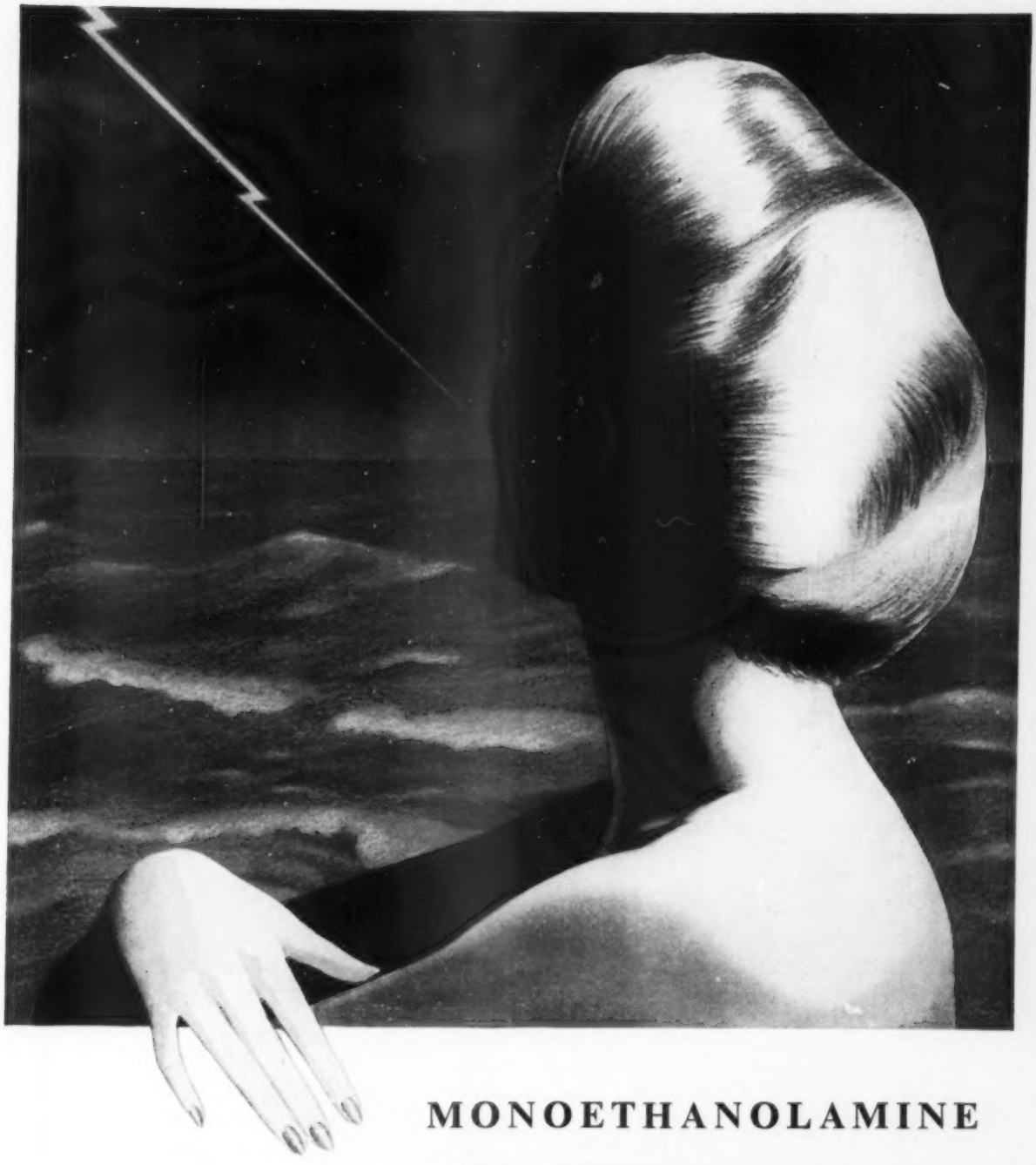

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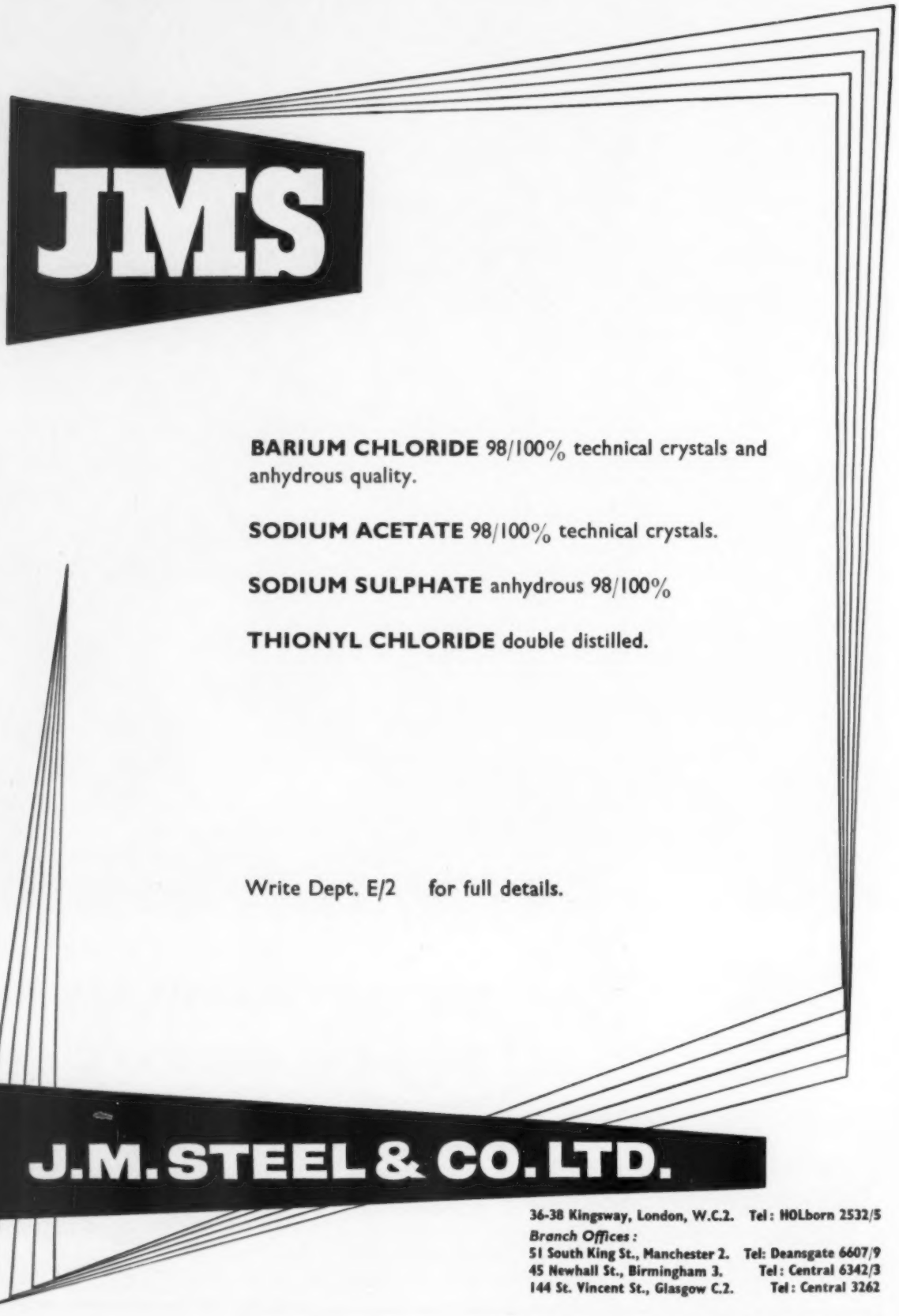
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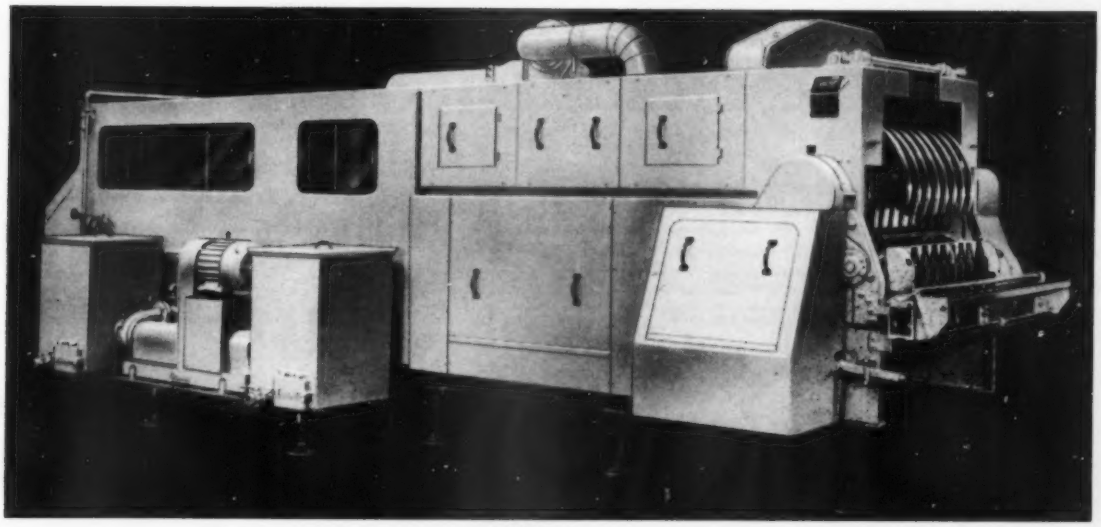

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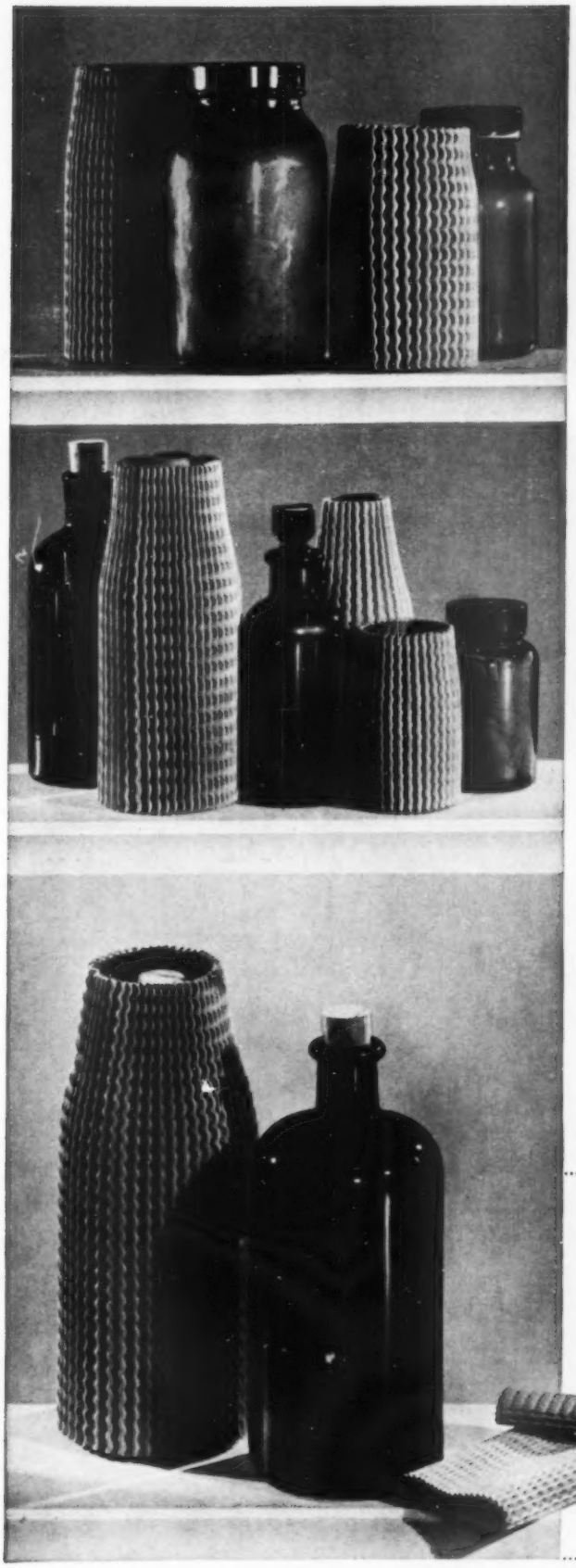

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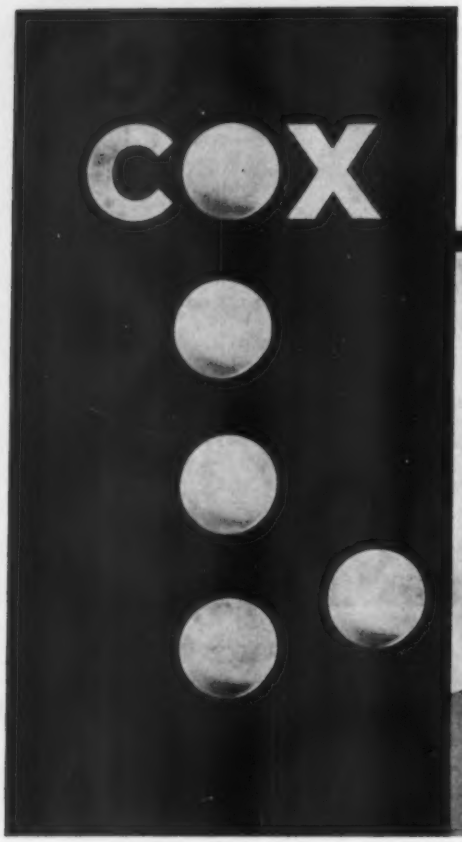

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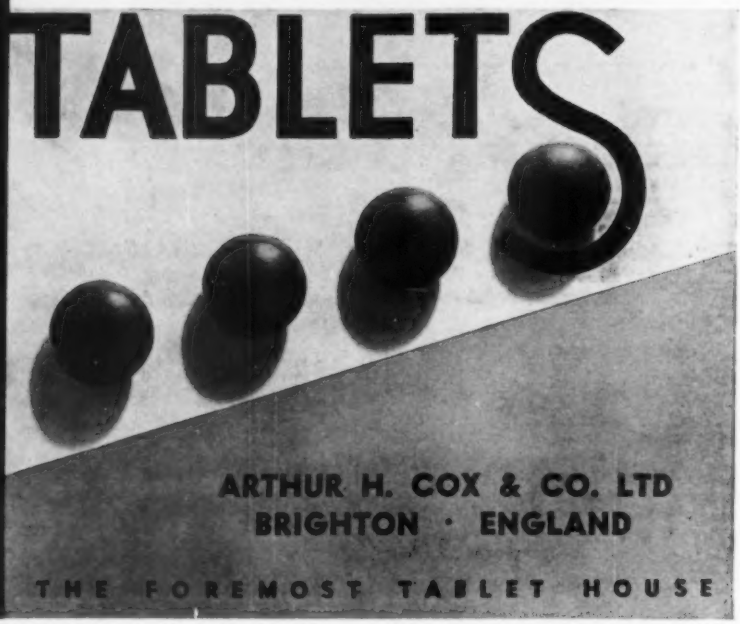

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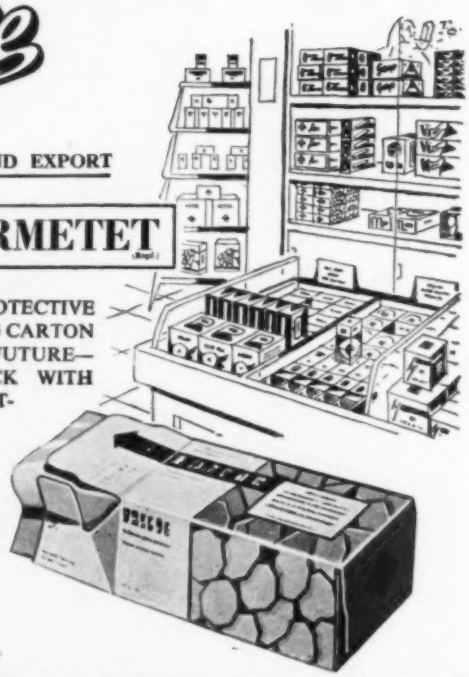

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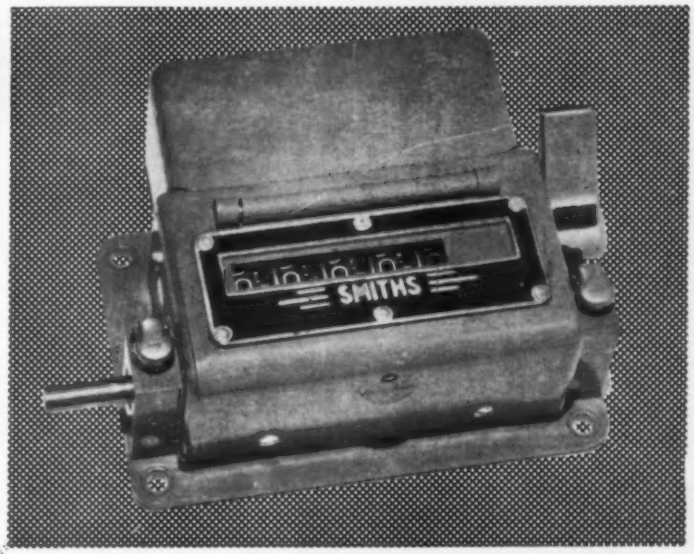

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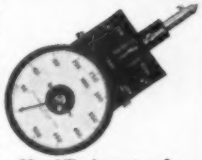
Body:	Die-cast alloy, reasonably dust- and dirt-proof.
Counter:	White on black figures.
Speed of Count:	4,000 counts/min. Maximum Shaft Speed: 5,000 r.p.m.
Drive:	R.H. or L.H., plain shaft or flex attachment.
Rotation:	Top going or top coming.
Micro Switch:	Supplied in wide choice of agreed manufacturer/client ratings.
Total Weight:	With flex attachment, 2 lb.; plain shaft, 1 lb. 15 oz.



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Maximum Filling Depth	11/16"	11/16"	13/16"
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Type of Die	BB33	B	D

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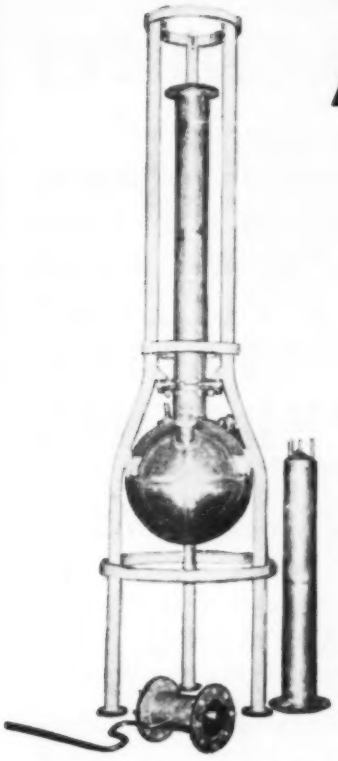

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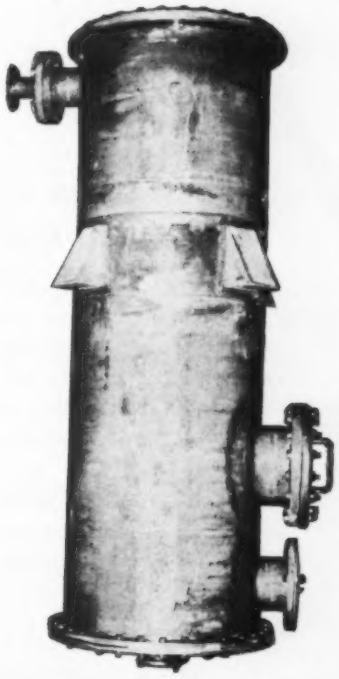

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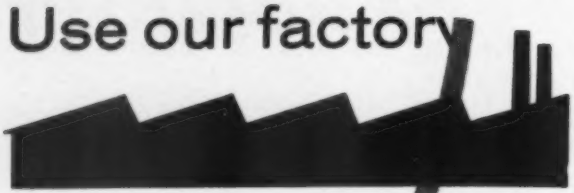

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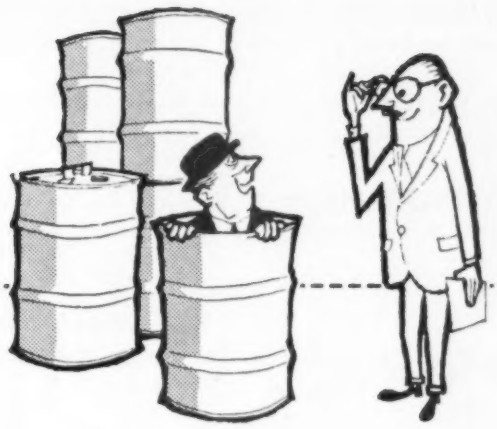

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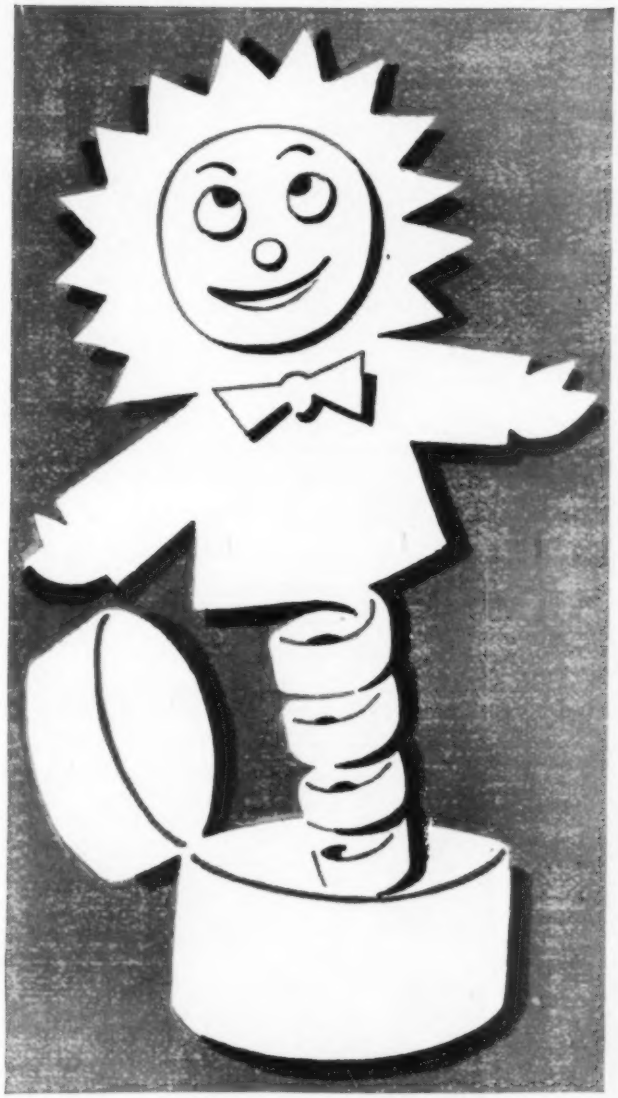

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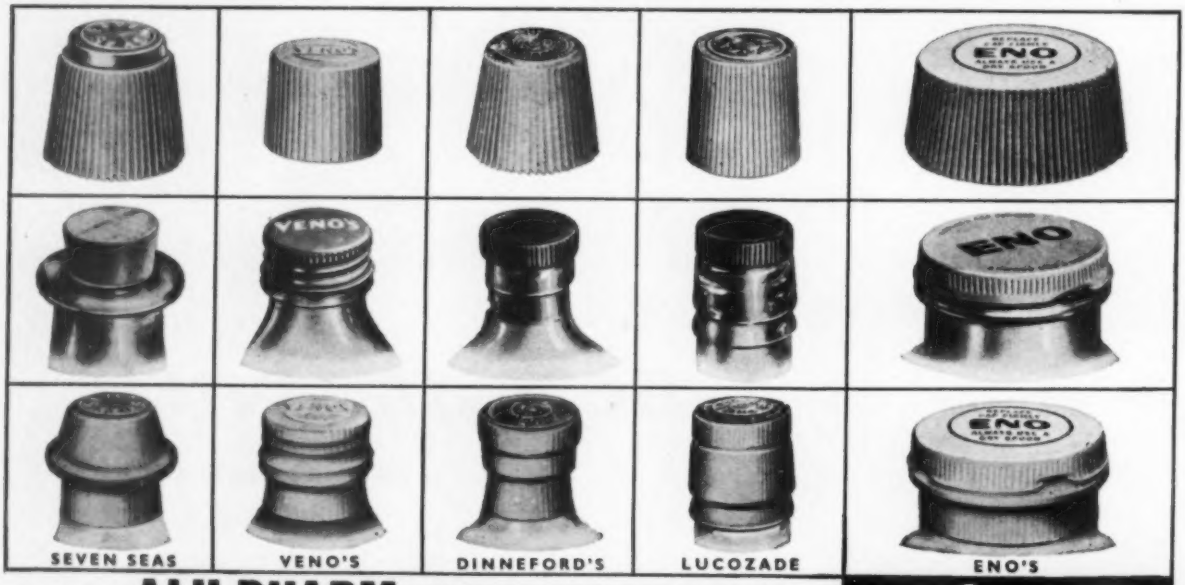

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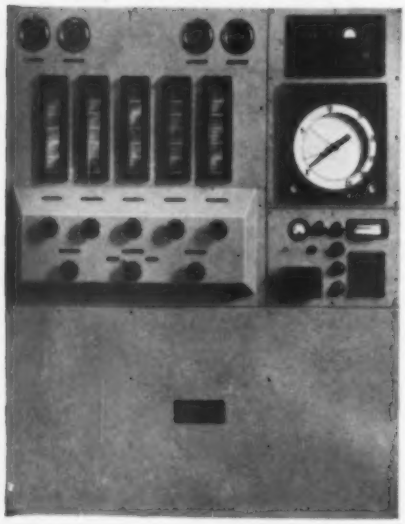

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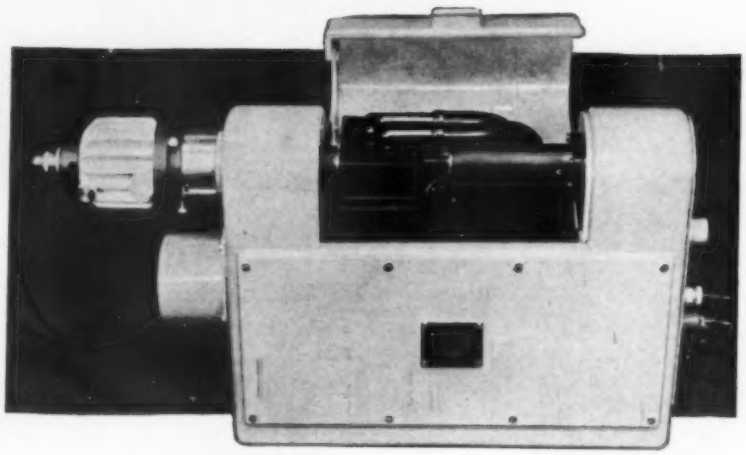

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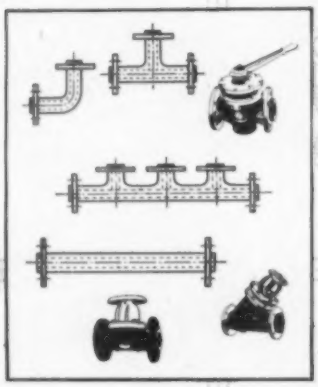

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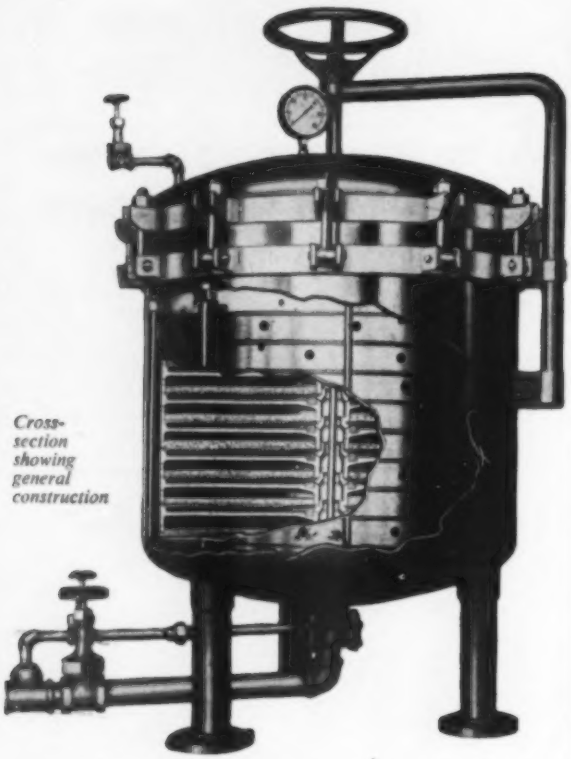

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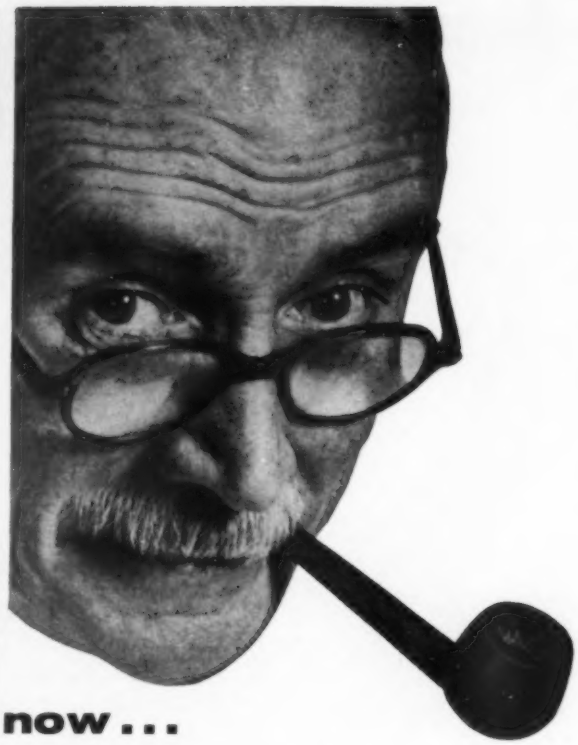

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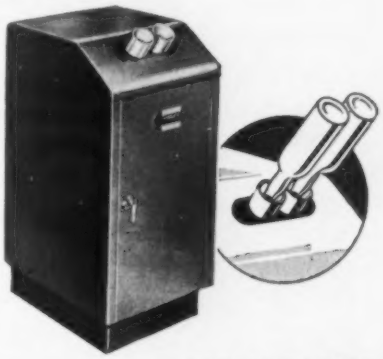

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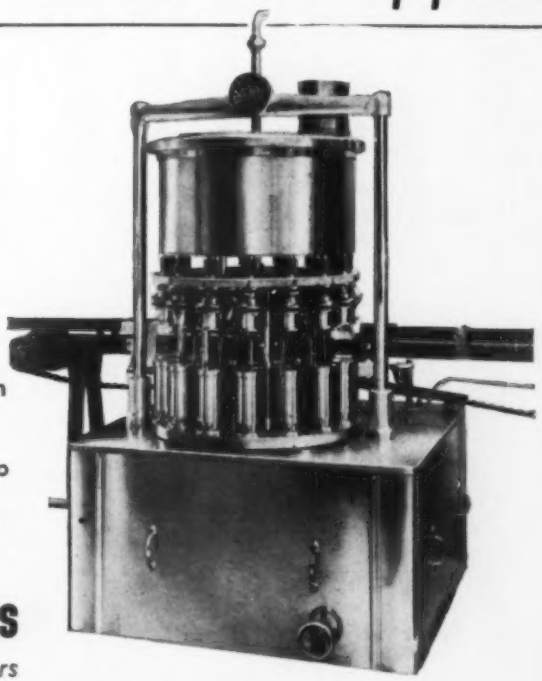

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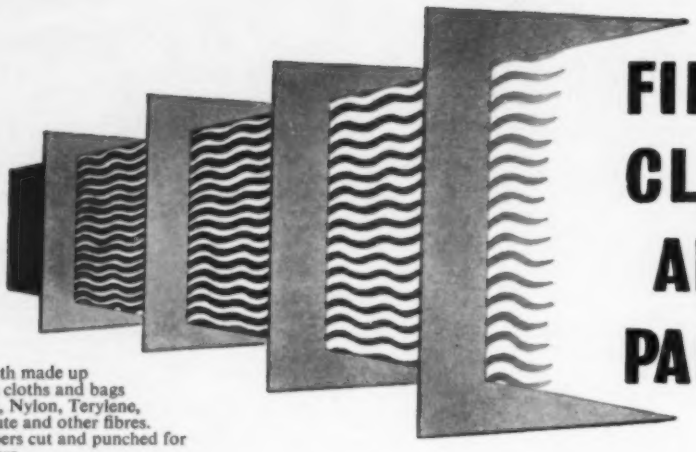

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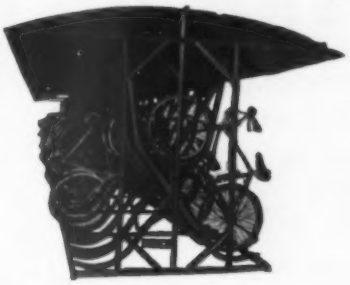

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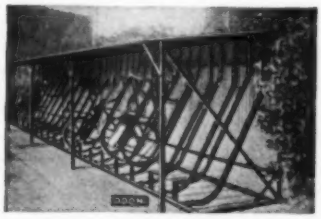

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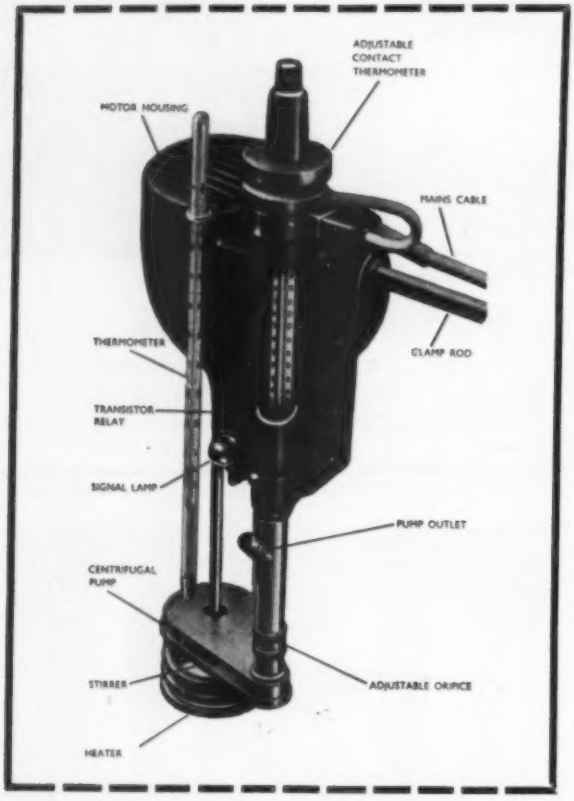

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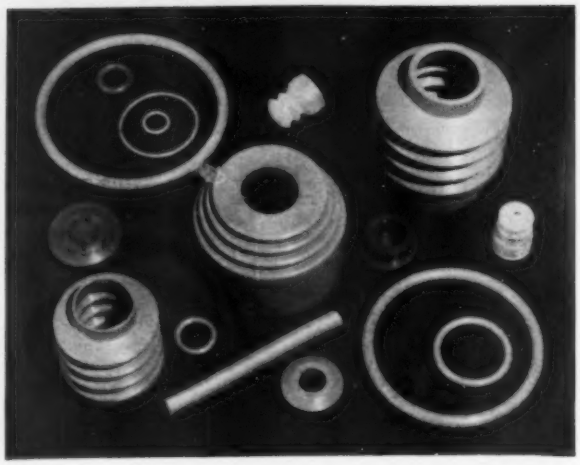

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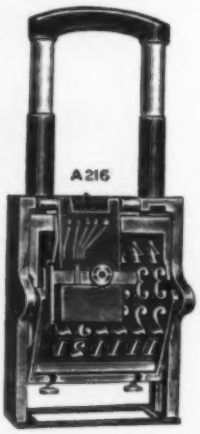

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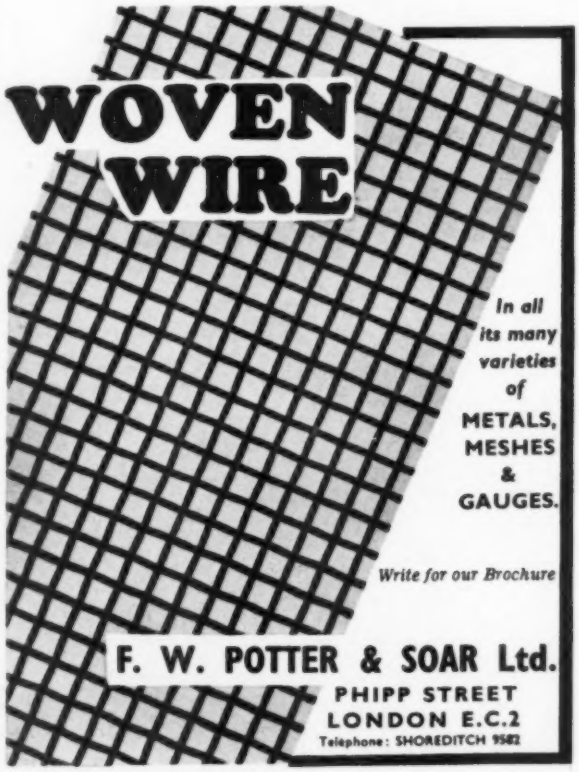
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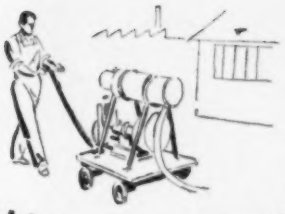

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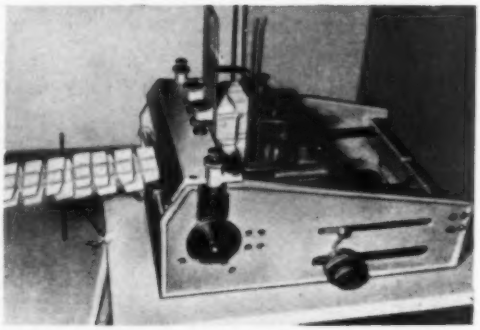

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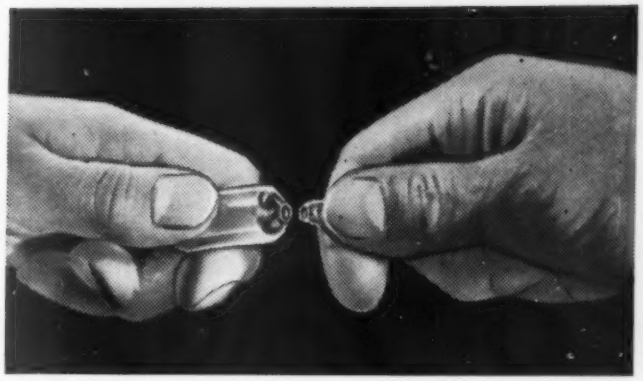

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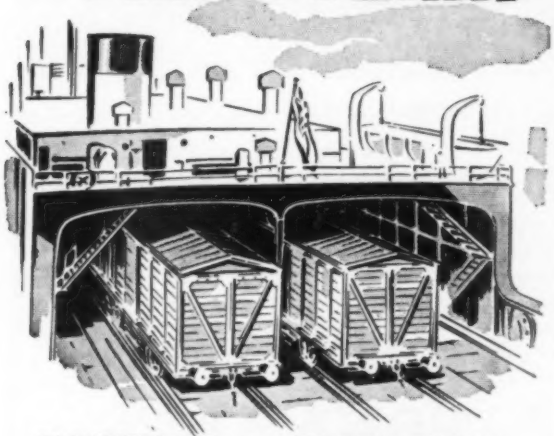

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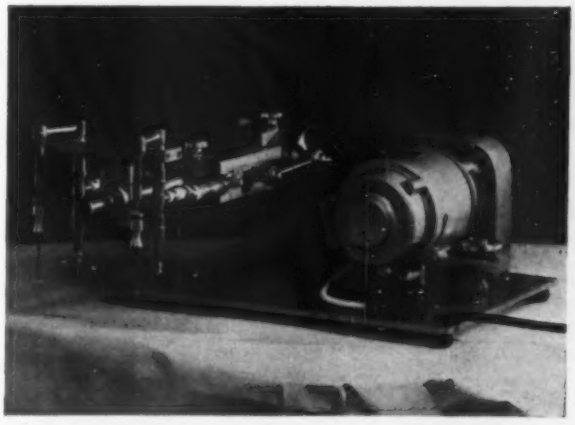

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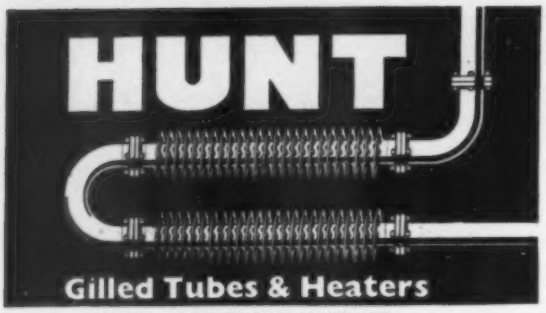

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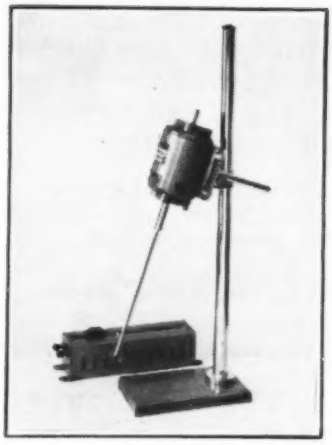

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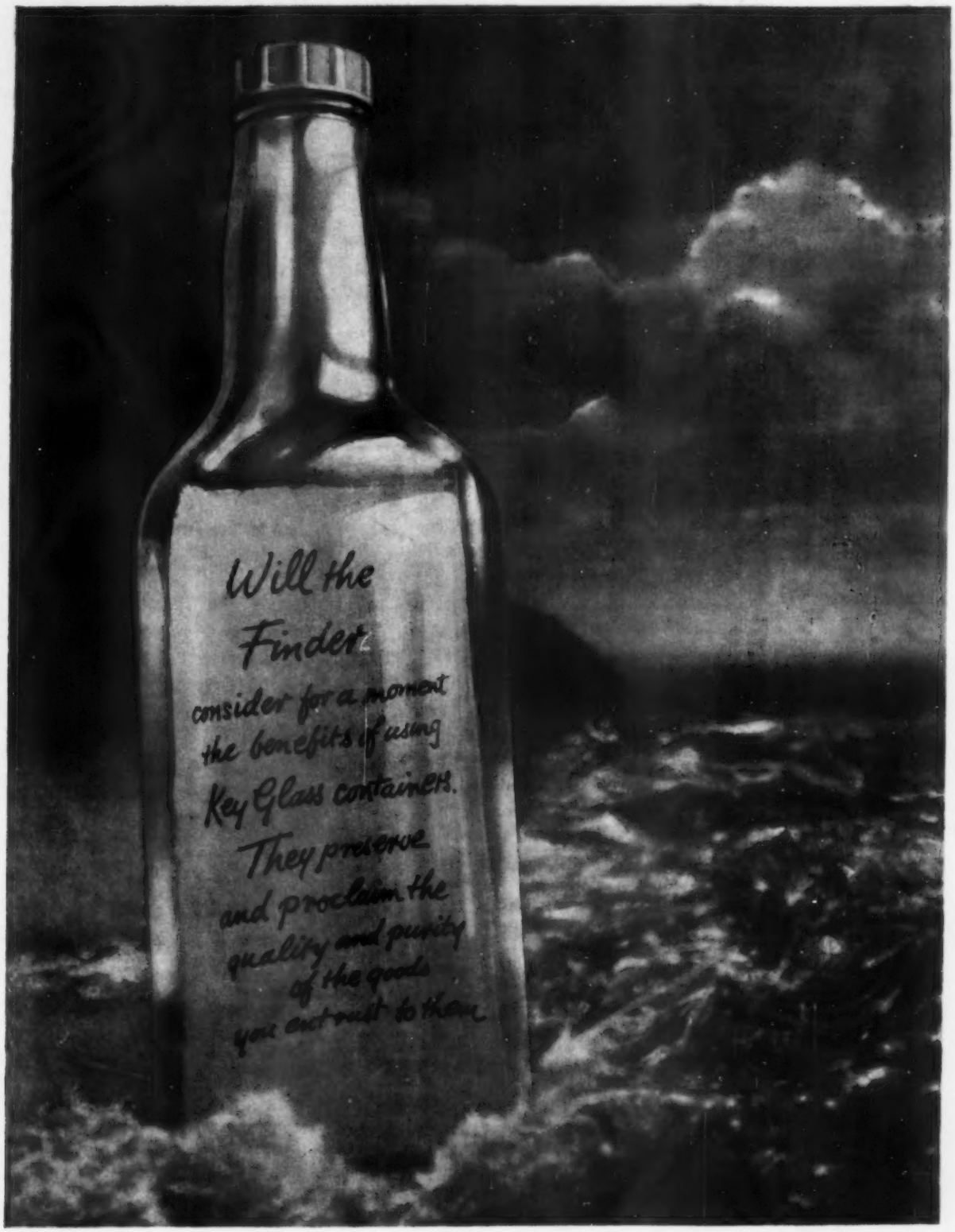

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